Journal

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Vol. XXIV No. 1 February, 1956

A.A.N.A. 25th Anniversary

Gertrude L. Fife *

Twenty-five years ago a handful of nurses met in Cleveland to form an association of nurse anesthetists. If that meeting were held today we would assume that they were organizing to protect themselves, improve their working conditions or for some such reason. I am glad that that meeting was held 25 years ago. The motives that prompted that meeting may be a bit old-fashioned but they have carried us a long way.

Before nurses entered the field of anesthesia most anesthesia was being given by untrained personnel, the intern, or the medical student. A bare handful of men with a medical degree was interested in anesthesia. The nurse was invited, by the surgeon, to enter the field. Each year new branches of surgery were being explored and as a result each year more and more responsibility was placed upon the nurse anesthetist. The demand for nurse anesthetists was increasing rapidly and new schools were being organized. If the nurse anesthetist was to meet the demands made upon her, she realized that there must be available a means of pooling experiences, and an exchange of ideas relative to the education of the nurse anesthetist. The sole aim of those nurses who met in Cleveland was to make available better anesthesia service to the patient, the surgeon, and the hospital. I hope that we will always pattern our activities on the same unselfish motives and dedication to duty that prompted those women to meet in the classroom of Lakeside Hospital on June 19, 1931.

What have we accomplished in those 25 years? We have a membership of around 8,000; we have a workable, efficient headquarters in Chicago; we have a substantial bank account: but we have done more than that. We have spent our time and money on programs that would place at the disposal of the hospital efficient nurse anesthetists for anesthesia service. Our emphasis has been entirely on education. I am proud of the fact that we have maintained our

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*Second president of A.A.N.A., former Director, School of Anesthesia, Lakeside Hospital, Cleveland, and Associate Editor, Journal A.A.N.A.

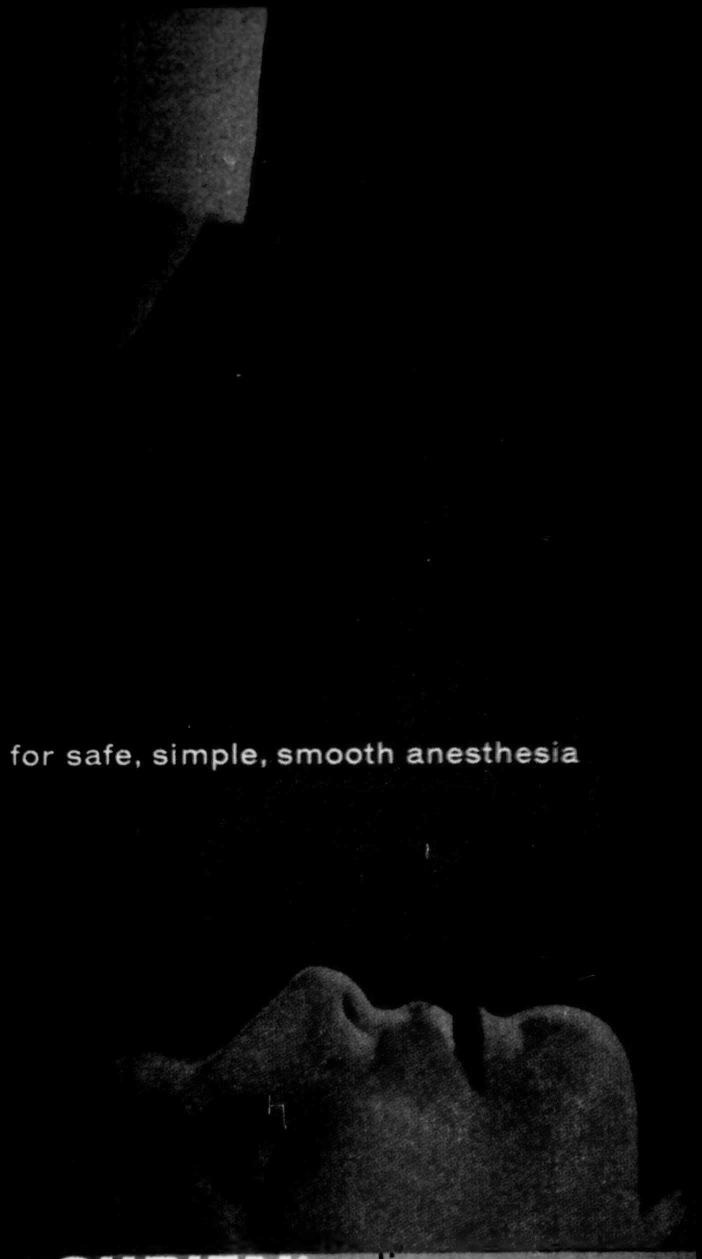
dignity when it would have been so easy to fight back at those who wish to discredit the work of the nurse anesthetist.

We now have 106 schools of anesthesia. We have helped in their organizational problems. We have a continuing inspection and grading of schools. We have a qualifying examination which means that before any nurse may become a member of our association she must first pass a rigid examination. Through our organization we have become known in the hospital field. The anesthetist is no longer just a member of the surgical team made available to the surgeon in the operating room. It was largely as a result of our efforts that anesthesia has become recognized as an art and a science.

We are justly proud of our accomplishments and particularly so when we realize that the work was done by our members. We did not seek grants or solicit large contributions. We started with only a few dollars in the treasury. Women holding full-time, responsible jobs in anesthesia travelled miles over week ends to meet with other members to map out programs. We were fortunate in that we had far-seeing men in the hospital and surgical groups interested in our work and our progress. They gave us moral support, advice and the stimulus to go forward. We are grateful to them.

Little has been said or written about the actual work of the nurse anesthetist. When lung surgery, heart surgery, and brain surgery were in their infancy, the nurse anesthetist was at the head of the table. When I left University Hospitals in 1946 we had performed so many heart operations that the anesthesia was a relatively simple procedure. At least we were past the pioneer stage. We, as nurse anesthetists, had been given a job to do, and we did it. The pharmacologist and the physiologist working in the laboratory gave us the tools to work with, and we used them. The total picture hasn't changed much today except that the drug companies have made available to us so many new and different drugs that the actual conduct of an anesthesia is much easier once one has mastered the basic principles and signs of anesthesia. The teaching of anesthesia, however, is more difficult and complicated because of the new drugs. Several surgeons have said to me recently that, in their opinion, anesthesia today is being made too complicated and mysterious. The mystery to me lies in the fact that an art and science so long overlooked has suddenly become of such importance.

Now, what about the future of the nurse anesthetist? It is just as bright as you want to make it. If you, the younger anesthetist, dedicate yourself to service, maintain high standards, uphold the dignity of your profession, and keep your motives uncluttered with selfish, material gains, you will always have a respected place in the field of anesthesia. Keep alive the spirit of that little group that met in Cleveland 25 years ago.



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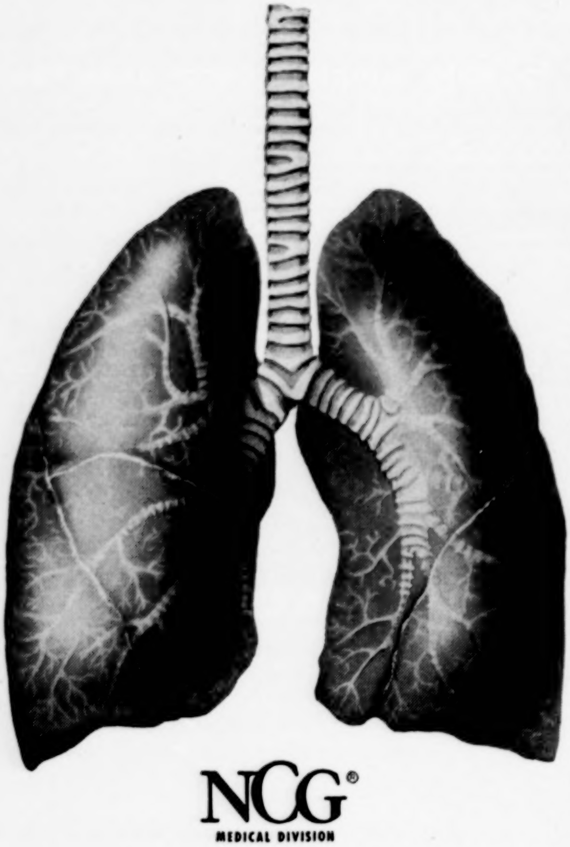

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Greetings from Wisconsin

The Silver Jubilee of any organization is a time for congratulations, for remembrance of founders and leaders, for planning a greater future, and most important, for humility, too.

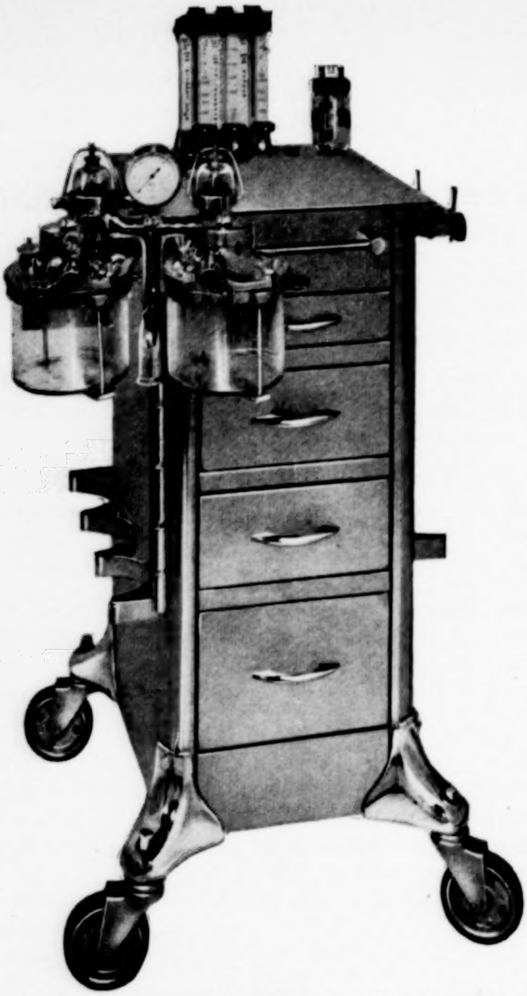
1956 is the Silver Jubilee year of the American Association of Nurse Anesthetists and the Wisconsin Association, happy in its affiliation with the National Organization, offers its sincere wishes.

WANA recalls with a new surge of inspiration, the message of Miss Agatha C. Hodgins when she said the dedication of nurse anesthetists "promises warmth, light and security to the present generation and continuing beauty and usefulness for all time to come."

The National Association, because of the devotion of its founders and succeeding leaders and the daily efforts of each individual member, has become a vital element in making that promise a vigorous but gentle living thing, seeking always new achievements in the alleviation of human suffering and fear.

The very closeness of the nurse anesthetist's service to the preservation of life itself, makes the Association's 25th year a time for renewed dedication of purpose in searching unceasingly for more of God's help in carrying on its work. May the rededication continue to emphasize selflessness, courage, perseverance, simplicity, for these are the qualities of which humility is made—these and devotion to God and fellowman.

SISTER M. YVONNE
President W.A.N.A.



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Airway Problems in Pediatric Anesthesia

Robert M. Smith, M.D. *
Boston, Massachusetts

It has been shown by several surveys[1,2] that the incidence of anesthetic death and cardiac arrest is unreasonably high in infants and children. The most frequent cause of anesthetic deaths in children is airway obstruction. Consequently airway problems in pediatric anesthesia deserve serious consideration.

Maintenance of a clear airway is one of the most elemental rules of anesthesia, but one which we too often fail to observe, either through carelessness or technical difficulty. When dealing with infants and children, factors enter which make a clear airway both more important, and more difficult to maintain. The increased metabolic activity of young patients means that a proportionately higher rate of oxygen supply is required and that any factor causing obstruction or hypoxia will act more quickly.

Unfortunately, both anatomical and physiological characteristics of the child seem to stand in the way of better oxygenation. The small child has several anatomical features that tend to interfere with a good airway: a large, poorly supported head; short, weak neck; large tongue; high, narrow larynx; and frail thoracic cage combine to make the passage of oxygen a perilous one. Physiologically, especially in infants and younger children, the nervous control of respiration is not completely developed, so that relatively minor insults such as mild hypoxia or resistance may set up abnormal respiratory patterns of gasping, tracheal tug, etc., which are difficult to correct, and which if not controlled, may develop into more serious derangements.

To anesthetize a child maintaining an unobstructed airway with an even, unbroken exchange from beginning to end of anesthesia is a real achievement.

STEPS IN PREPARATION AIMED AT PREVENTION OF AIRWAY OBSTRUCTION

Successful maintenance of an airway, like most worthwhile undertakings, requires careful preparation. Preparation here includes equipment as well as patient, and both aspects, though tremendously important, are frequently neglected.

1. **Equipment:** To insure a clear airway in children, the importance of equipment cannot be overemphasized. It sometimes

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*Children's Medical Center, Boston, Mass.
Presented at the 22nd Annual Meeting of the American Association of Nurse Anesthetists, Atlantic City, New Jersey, September 19, 1955.

seems almost impossible to have an adequate variety of apparatus for all the varied sizes and shapes of infants and children that are to be encountered. Many anesthesia departments are surprisingly short in their pediatric equipment, apparently feeling that one child-sized airway or mask is adequate. It is no more adequate than a shoe store with one "child-sized" pair of shoes. Masks, airways, endotracheal tubes, and adapters must be on hand in a wide variety of sizes if we are to carry children safely through the extended surgery now undertaken. Any anesthesia service should have a variety of masks, and airways should be available in several graduated sizes (0. 1, 2, 3, 4). It is especially important to have a full assortment of endotracheal tubes (sizes 12, 14, 16, 18, 20, 22, 24, 26F), and three or four different sized laryngoscope blades for infants and children. It is essential to use the correct size in such equipment, and not one slightly too large or too small. To improvise in this field is almost impossible, and attempts are made only at great expense to the patient.

When about to induce a child, you must be sure that all is in complete readiness, for you can't leave such a patient and run back to get a forgotten suction catheter. Preparation must be meticulous and complete. The most essential equipment for inhalation anesthesia includes airways, suction, oxygen, laryngoscope and endotracheal tube. A strong suction apparatus must be within reach of the anesthetist, and must be tested before anesthesia is commenced. A stethoscope to be strapped to the child's chest should be standard equipment, as it is invaluable in checking the airway throughout anesthesia.

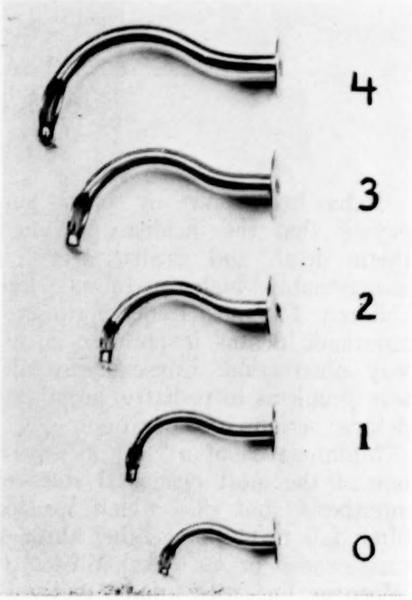

Fig. 1. A wide assortment of equipment is essential. Oral airways, size 0 through 4 must be available.

2. **Preparation of Patient:** Careful preparation of the child can do much to prevent airway obstruction. A child who is calm, cooperative and relaxed will pass through the excitement stage with a minimum of complications. One who is apprehensive or resistant will be apt to have prolonged induction complicated by increased spasm, retching and vomiting. An intelligent approach to this problem combines both reassurance and sedation. Before bringing children to the hospital for

elective operations, the parents can help by explaining the necessity for surgery, and describing some of the hospital procedures. Surgeons, floor nurses, and especially anesthetists, can establish a sense of security on pre-operative visits. Some patients control themselves under great mental effort, concealing their dread under a quiet exterior. Some are completely resistant to all approach, others are too young to understand. For all children, whether relaxed, self-restrained or uncontrollable, preoperative sedation seems indicated as a logical and dependable method of making induction both more merciful and more safe. Children, due to their higher metabolic activity and lack of self control, require proportionately more sedation than older patients. Several different agents and dosage schedules have been used with relatively similar results. Our present method utilizes nembutal from the age of six months, adding morphine at one year (see table).

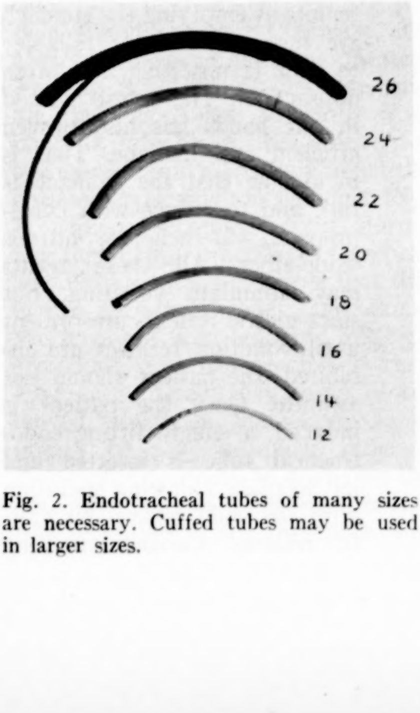

Fig. 2. Endotracheal tubes of many sizes are necessary. Cuffed tubes may be used in larger sizes.

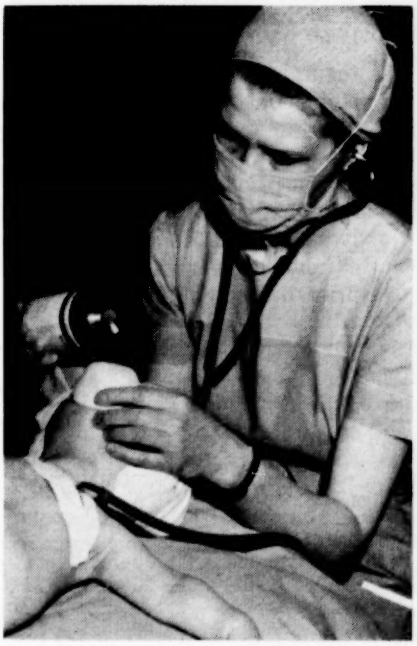

Fig. 3. The stethoscope, strapped to the child's chest, gives best check on airway and heart.

To prevent secretions and vagal reflexes, atropine or a related agent is used in all patients from the newborn period onward. Though some anesthetists abstain from its use fearing atropine poisoning or heat retention, most agree that the belladonna drugs have a wide margin of safety, and that the advantages in blocking secretions and vagal reflexes far outweigh any suspected disadvantages.

Preparation of the patient must include steps to prevent regurgitation and aspiration of stomach contents. This can be done in most elective cases by restricting oral intake for four hours prior to anesthesia. Infants with pyloric stenosis usually retain gastric contents, and a Levin tube should be passed prior to beginning of induction.

TABLE FOR PREOPERATIVE MEDICATION FOR INFANTS AND CHILDREN

Age	Av. Wt.	Seconal or Nembutal p. r.	Morphine	Atropine	Scopolamine	Demerol
Newborn	7 lbs.	- -	- -	0.1 mg.	- -	- -
6 mos.	16 lbs.	30 mg.	- -	0.2 mg.	- -	- -
1 yr.	21 lbs.	50 mg.	1.0 mg.	0.3 mg.	0.1 mg.	10 mg.
2 yrs.	27 lbs.	60 mg.	2.0 mg.	0.3 mg.	0.2 mg.	20 mg.
4 yrs.	35 lbs.	90 mg.	3.0 mg.	0.4 mg.	0.2 mg.	25 mg.
6 yrs.	45 lbs.	100 mg.	4.0 mg.	0.4 mg.	0.2 mg.	40 mg.
8 yrs.	55 lbs.	120 mg.	5.0 mg.	0.4 mg.	0.3 mg.	45 mg.
10 yrs.	65 lbs.	150 mg.	6.0 mg.	0.4 mg.	0.3 mg.	50 mg.
12 yrs.	80 lbs.	150 mg.	8.0 mg.	0.6 mg.	0.4 mg.	50 mg.

Table I.

The same measure should be taken for all patients who have distention or who have been vomiting. With small newborn infants that are distended it is often safest to pass a stomach tube, and then to intubate the trachea without anesthesia, thus maintaining protective reflexes until the trachea is safely protected.

One of the most common types of preventable deaths occurs in the child who enters the hospital with a minor cut or fracture received a short time after a meal. After a brief, struggling etherization and a short surgical procedure, the child starts to waken, vomits, aspirates and dies. This happens with unbelievable frequency. Three such deaths occurred in greater Boston in one month last year. This dangerous type of airway obstruction requires a well organized approach, which we may do well to describe in full at this point.

There are several methods of handling such patients. Attempts at emptying the stomach are messy and never reliable; to wait is upsetting and often impractical. The safest method in our hands has also proven efficient and humane. That is to assume that the stomach is full, and to induce with cyclopropane, vinethene, or nitrous oxide-ether. All these agents may stimulate vomiting, but since glottic reflexes are present until vomiting reflexes are inhibited, the patient should not aspirate. Once the patient is induced, a snugly fitting endotracheal tube is inserted and left in place following operation until the child regains his glottic reflexes. Copious vomiting often occurs during recovery, but with the tube in place, the airway is safe. The tube is not removed until the child is really awake, opening his eyes, and making facial grimaces. One patient undergoing this treatment was so wide awake when the tube was finally withdrawn that he opened his eyes, saw the anesthetist holding the tube over his face and said, "You aren't going to put that back in, are you?"

AIRWAY PROBLEMS DURING INDUCTION

Airway obstruction may occur at any time during anesthesia, but in general the handling of airway problems depends upon whether they arise during induction, maintenance or recovery phases. During induction, the airway is threatened by secretion, spasm, and vomiting. Obstruction may occur due to secretions, in spite of atropinization. Care should be taken not to suction over-enthusiastically early in induction, lest the patient waken, excitement increase, and anesthesia become more complicated. Turning a patient on his side, and allowing secretions to shift from pharynx into cheek will suffice for the moment and allow time to get the patient deep enough to suction safely. If copious secretions occur during anesthesia, our practice is to repeat atropinization. Some believe that this makes secretions ropey and thick. We have not been bothered by thick secretions, and believe that if they were encountered, they could be removed by suction. Suctioning should always be done in quick, efficient manipulations, to avoid depriving the patient of oxygen.[3] Prolonged induction regardless of the anesthesia, will result in more tendency toward secretions, consequently the excitement stage should be traversed as quickly as possible.

Spasm of glottis or vocal cords is frequent during induction. If occurring as result of irritation from too rapid use of Vinethene or ether, it will be relieved by reducing the speed of induction. Pentothal has gained a reputation for causing laryngospasm. Actually, if Pentothal is administered with caution, spasm should be extremely rare. When it does occur it may be severe and prolonged. Usually, oxygen may be pushed through the closed larynx with bag and mask pressure until cords relax, otherwise a rapidly acting relaxant may be used if equipment is at hand for carrying on controlled respiration.

Less has been written about spasm occurring with cyclopropane but spasm is more troublesome in our hands with cyclopropane than with other agents, especially with small infants. When an infant is induced with cyclopropane, retraction may start in the neck or subcostal area, and though respiratory motion continues, exchange will decrease and stop. Pushing on the anesthesia bag may help, but more probably will cause further reflex irritation, so should not be continued if it does not appear to help. The safest procedure is to lighten the anesthesia and allow the infant to awaken sufficiently to breath normally. Atropine, though not reliable in breaking the spasm,[4] seems to help to prevent it, and should be repeated if such spasm occurs.

Regurgitation and aspiration of stomach content, already discussed, can bear repeated emphasis. Although well prepared patients without intestinal obstruction should give little trouble, one must always be on guard. In addition to the problems mentioned previously, two warnings might be noted. One is that if a patient with intestinal obstruction comes to the operating room with a Miller-Abbott tube in place, the anesthetist may be led into the error of assuming that the stomach is being emptied by the tube. Actually the tube may have passed far down into the gut, allowing secretions and bowel content to re-accumulate in the stomach. A Levin tube should be passed in such patients in addition to the Miller-Abbott tube.

The other warning concerns rapid induction of patients who may have full stomachs. Pentothal-curare mixtures seem very tempting as a rapid, easy method of inducing patients with full stomachs. However, relaxation of stomach and esophagous may allow gastric contents to well up into the pharynx and flood into the trachea in less time than it takes to pick up a laryngoscope. Several deaths have been reported under these circumstances, and consequently the method seems dangerous.

A common nuisance is the obstruction due to enlarged tonsils and adenoids. This can create a problem by causing obstruction before the patient is deep enough to tolerate an oropharyngeal airway. In this situation it is helpful to turn the child over on his side, or get him over farther so that he is nearly prone, until deep enough to allow passage of an airway. A nasal airway may be helpful in patients with obstructive tonsils and adenoids, but there is considerable danger of tearing mucosa or adenoids, unless a soft, blunt, tube such as the Saklad tube is used. Such a tube should be well lubricated. An oral airway should be tried as soon as the jaws can be separated.

OBSTRUCTION DURING MAINTENANCE

A variety of dangers may threaten respiration during maintenance of anesthesia. Obstruction by blood and secretions within the airway, external pressure, poor position and apparatus resistance may combine to make life really difficult for the young child. With proper technic, however, such problems should be more easily managed during surgical anesthesia than during induction or recovery. The anesthetist has more complete control of the patient—that is—provided he does not lose access to the airway. The anesthetist must maintain control of the airway at all times, and be able to clear airway obstruction or inflate the lungs at any point in the operation.

Endotracheal intubation is undoubtedly the most reliable means of maintaining a clear airway and no patient should be put to sleep unless equipment and personnel for emergency intubation are immediately available. Since there are some possible disadvantages involved, intubation does not seem indicated in many simpler procedures, where the patient is supine, and surgery does not interfere with respiratory control.

Some patients need no more assistance than support of the chin in order to maintain exchange. With Pentothal-nitrous oxide it seems definitely better to avoid use of an oral airway if the exchange is adequate without it. Under ether, pharyngeal reflexes are obtunded and the airway is used without hesitation. With small infants that are operated upon under cyclopropane, the tongue oftens clings to the roof of the mouth, blocking exchange completely, so that the use of an airway has become our rule in all such cases.

What are the indications for endotracheal intubation in children? Most anesthetists agree on the importance of intubation in children undergoing surgery within the head or chest, those in prone position, and those with full stomach or intestinal obstruction. Without intubation, these patients are in danger of respiratory obstruction or depression without available means of treatment.

It also seems definitely preferable to intubate children for surgery about eyes, mouth, face and neck, and for many abdominal conditions—especially long procedures and those in the upper abdomen.

There are some procedures wherein intubation seems optional, due to good reasons both pro and con, and to experience showing that either method can be used safely. Tonsillectomy is an outstanding example of this class. Many children die each year due to aspiration of blood and debris at tonsillectomy. Though intubation is an excellent method of preventing such aspiration, equally good statistics are shown where patients have not been intubated if care is taken to keep patients in Trendelenberg position, and to keep the trachea clear. If surgeons are encountered who insist on the antiquated sitting-up position, under general anesthesia, the anesthetist must protect the patient by use of endotracheal tube well sealed by cuff or packing.

Whether the patient is intubated or not, there are many insidious complications that can occur—and which must be watched for with great care. The most reliable information as to adequacy of ventilation is obtained by the continuous use of a stethoscope strapped to the child's chest. Though respiratory movements of abdomen may continue, exchange may be blocked abruptly by spasm or secretions. Visual observation may not note the difference, but with a stethoscope it is immediately evident.

The presence of an endotracheal tube does not prevent blood from entering the trachea—but may actually increase the danger. In harelip and cleft palate surgery, blood can run down along the outside of the endotracheal tube and into the trachea unless the tube is snugly fitting or well packed off. Such cases should be followed very carefully throughout operation. After surgery, the hypopharynx should be visually inspected for clotted blood and the chest should be very thoroughly checked with a stethoscope for the presence of blood in the trachea.

The endotracheal tube itself can be the origin of several hazards. Serious injury and infection of larynx and trachea follow roughness or the use of soiled equipment. However, tracheitis following intubation is rarely seen in hospitals where careful technic is used. Immediately after passage of the tube there may be bronchospasm which makes it impossible to ventilate the child. Use of cyclopropane for a few moments, followed by gradual addition of ether will usually relieve the spasm.

The most frequent complication of intubation is obstruction of the left main bronchus by passage of the tube down into the right bronchus. This usually causes tugging and uneven respiration. Obstruction can also be caused if the endotracheal tube is thick walled, too small, kinked, or blocked by dried secretions.

AIRWAY PROBLEMS DURING RECOVERY

As anesthesia is discontinued and the patient gradually regains his reflexes, he may pass through several critical phases. Extubation, especially in infants, may be followed by severe and prolonged laryngospasm, which may be associated with cyanosis, bradycardia, or cardiac arrest. There is no safe time for extubation, light or deep, but taking precautions will minimize the difficulties attending extubation. Suction of nose, pharynx, and trachea should be done without upsetting the patient or causing oxygen depletion. Suction catheters should not occlude the endotracheal tube and after suctioning trachea, the child should be allowed to resume normal respiration before extubation. The tube should be slipped out gently without simultaneous suctioning. It is most important to watch intently for the child to take his first breath and resume normal exchange after extubation, for apnea may be prolonged, and resuscitation is sometimes necessary. For this reason, *extubation should not be performed unless a laryngoscope is at hand and ready for use in reinserting the endotracheal tube.*

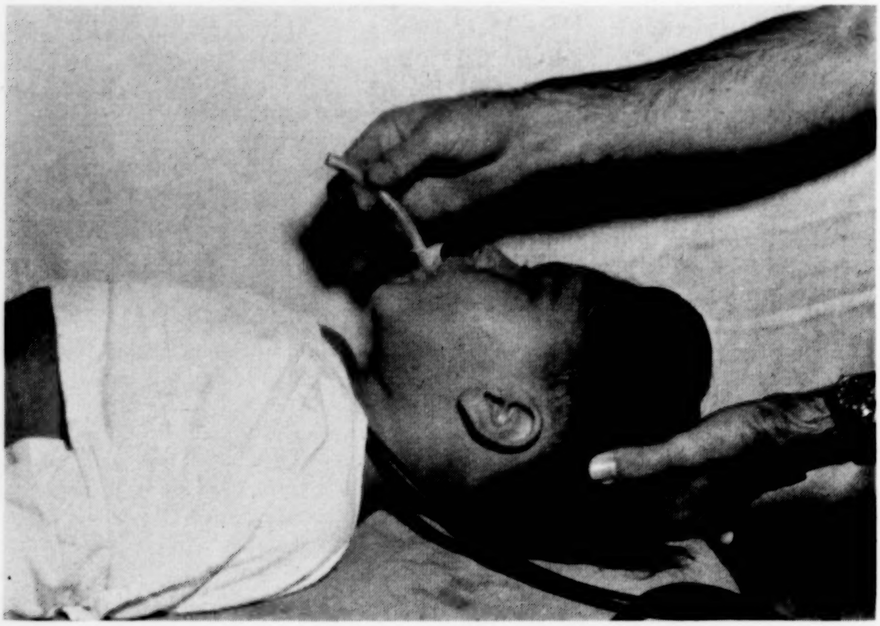

Fig. 4. Before extubation the patient should be suctioned, then allowed to resume normal respiration. Finally, the endotracheal tube is slipped out without simultaneous suctioning.

If care is taken to make sure the airway is entirely clear at the end of operation, post-operative respiratory complications can virtually be eliminated. Any sign of inadequate or obstructed respiration must be checked and corrected. A final stethoscopic inspection of the chest may reveal rales or rhonchi. If these can not be cleared by suctioning the pharynx and making the patient cough, the glottis should be explored and the trachea suctioned. Bronchoscopy is seldom required, and is to be avoided unless solid or very tenacious material is present.

Recovery from any anesthetic may entail nausea and vomiting. In our experience, cyclopropane is followed by less vomiting than either the volatile agents or Pentothal, nitrous-oxide and curare. It is preferable to have all patients watched in a recovery room until awake. Whether in recovery room or the patient's room, suction should be available, and the patient in proper position on side or semi-prone position, perferably with feet slightly elevated. An oral airway should be left in place until the patient objects to it.

In patients who have been intubated, special check should be made for signs of tracheal edema. Cough, hoarseness or retraction should be signs for treatment with humidification and careful scrutiny in regard to tracheotomy.

Summary

1. Anesthetic mortality is high in children.
2. Airway obstruction plays a large part in this mortality.
3. Preparation of patient with reassurance and sedation are important safeguards.
4. A wide variety of equipment is fundamental in pediatric anesthesia.
5. During induction, spasm, secretion, and vomiting are to be avoided.
6. The anesthetist should have full control of the airway during maintenance. Endotracheal intubation is indicated for many cases, but may introduce further problems.
7. Recovery phase may entail spasm, vomiting, aspiration, or tracheal irritation. Extubation should only be done when the patient is well oxygenated and breathing normally. If the patient is suspected of having eaten recently, he should be intubated, and the endotracheal tube should not be removed until the patient is awake.

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Deliberate Hypotension

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The reduction of systemic blood pressure during surgery has always presented a challenge to the operating team. This challenge has been met for the most part by instituting methods which most quickly will restore the blood pressure to its previous level. Little attention was directed to a definitive study of the possible consequences of a reduced blood pressure during surgery. The majority opinion left little doubt that hypotension was uniformly bad and that, if possible, it should be avoided. With the establishment of such long standing opinions, whether right or wrong, it was no wonder that the recently advocated practice of deliberately reducing blood pressure during surgery met a wave of reaction and skepticism. The questions that invariably were asked were: 1. Why should blood pressure intentionally be reduced? and 2. What are the complications that might result from such a practice? We will attempt to answer these questions.

The problem of hypotension whether intentionally or unintentionally occurring during surgery is of vital concern to all anesthetists. Those of us who administer anesthetics to patients see hypotension very frequently. It is our responsibility to respect this complication and to appreciate its implications. We should not, however, maintain that its occurrence inevitably results in morbidity or mortality.

The intentional decrease in systemic blood pressure during surgery was advocated as an aid in the prevention of excessive blood loss before it occurred or as a means of reducing or arresting an already existing hemorrhage. The concept is a simple one. By reducing the pressure head or the force which tends to drive the blood out of cut vessels, it is possible to promote the clotting of blood with greater facility and rapidity. This obviously can be very beneficial to the surgeon. Many other lesser advantages of deliberate hypotension may be mentioned:

1. By reducing blood loss, the needed number of replacement transfusions will be decreased—an important consideration where difficulty is encountered in obtaining blood.
2. By reducing the number of transfusions, the incidence of transfusion reactions can be reduced. Transfusion reactions become an important consideration where massive blood replacement therapy is needed.
3. By reducing blood loss, operating time is reduced.

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4. By reducing blood loss and thus increasing visualization within the operative field, more extensive and complete surgical resections can be performed.
5. By controlling blood loss, it is possible to start and successfully complete operations which ordinarily could not be undertaken because of the constant danger of uncontrollable hemorrhage.

These are all very real advantages to the surgeon which cannot be overlooked. We must decide whether the dangers of the method outweigh these benefits.

METHODS OF PRODUCING DELIBERATE HYPOTENSION

Systemic blood pressure is the product of the cardiac output times the peripheral resistance. Cardiac output equals the product of the stroke volume times the cardiac rate.

Hypotension may be produced by:

1. **Decreasing the cardiac output.** This is the most easily accomplished by reducing the circulating blood volume. In 1946, Gardner and Hale[1] produced hypotension by arteriotomy—the removal of enough blood from the body to produce a significant lowering of the blood pressure to 80 mm Hg or lower systolic pressure. This technic produces true hemorrhagic shock. It carries with it the same inherent dangers and therefore has been discarded.
2. **Decreasing peripheral resistance** (producing widespread vasodilatation). Many technics and drugs used in anesthesia produce a decrease in peripheral resistance. Most depressant drugs, including opiates and general anesthetics, possess this property. Indeed deep general anesthesia alone (especially with ether) will produce a fall in blood pressure by widespread vascular dilatation. Most commonly, however, deliberate hypotension is produced by the chemical interruption of the sympathetic nerve fibers which innervate the peripheral blood vessels. Interruption of these fibers abolishes the normal vasoconstrictor impulses mediated by the sympathetic system. As a result, blood pressure falls. In 1948, Gillies and Griffiths[2] working in Scotland chemically interrupted the sympathetic outflow to the peripheral vessels by the administration of a total spinal anesthetic. With the widespread vasodilatation which resulted, enhanced by the deliberate omission of any vasopressor drug prior to the administration of the spinal anesthetic, blood pressure usually fell significantly. These investigators would then administer a general anesthetic together with the total high level spinal. The purpose of the general anesthetic was to reduce the cellular demands for oxygen since it was known that, in the face of a markedly reduced blood pressure, the available oxygen supplies for the tissues is likewise reduced. When using this technic, the patient, therefore, must be excellently oxygenated at all times and equally important, all blood lost must be replaced immediately. Gillies and Griffiths appreciated that anoxia was the important potential danger of the technic and by their admission, deliberate hypotension was a physio-

logic trespass. The combination of total sympathetic paralysis produced by a high level spinal anesthesia plus general anesthesia plus the positioning of the patient with the operative field uppermost produced a significant fall in blood pressure and ensured a relatively bloodless operative field.

In 1948, with the introduction of the methonium compounds by Paton and Zaimis,[3] in England, a new method of blocking the sympathetic nervous system became available. Various methonium compounds such as tetramethonium (C-4), pentamethonium (C-5), and hexamethonium (C-6) possessed potent autonomic ganglionic blocking properties which could be easily produced by the intramuscular or intravenous administration of these drugs. It was not long before deliberate hypotension was produced by using these drugs rather than spinal anesthesia. Even though like effects of the methonium compounds when given intravenously lasted 3 or 4 hours or longer, they provided greater controllability in producing hypotension than did total spinal anesthesia. The practice of deliberate hypotension using the methonium compounds spread throughout the British Isles. The technic most commonly used was to administer a general anesthetic to the patient in the routine manner. Cyclopropane was avoided because of its tendency to elevate blood pressure. At the appropriate time, doses of hexamethonium were injected intravenously to reduce the blood pressure to the desired level. The patients were positioned when possible with the operative field uppermost. This promoted the pooling of blood in the dependent portions of the body and further contributed to a bloodless operative field. The average level of systolic blood pressure for maintenance was at 70 mm Hg. At the completion of surgery, the blood pressure was slowly returned to its previous level by the use of vasopressor drugs and intravenous fluids. The patients were placed in the horizontal position and closely observed for many hours. In 1951, a new autonomic ganglionic blocking drug known as Arfonad was introduced. This drug, a thiophanium compound, produced ganglionic block of very short duration. Thus, when used as a hypotensive agent, greater controllability of blood pressure level could be expected. Arfonad for the most part has replaced hexamethonium in clinical practice. It is administered intravenously as a continuous slow drip.

While the practice of deliberate hypotension began in the British Isles, it was not long before it was used in this country. For some reason, it has never enjoyed the popularity it possessed in Great Britain. Its use in this country today is limited to the following situations:

1. Extensive radical resections for carcinoma.
2. Uncontrolled hemorrhage.
3. Operations which could not be initiated unless bleeding was first greatly reduced (Meningiomas, intracranial hemangioma)

The ultimate detrimental effect of a reduced mean arterial blood pressure depends upon the insufficiency of blood flow to certain critical organs such as the heart, brain, liver and kidneys. The blood flow to an organ depends upon the mean arterial blood pressure and the vascular resistance to the flow of blood within the organ. During hypotensive periods, there is a concomitant decrease in vascular resistance which roughly parallels the decrease in mean blood pressure. The ability of the body to make a satisfactory compensation in terms of maintained organ blood flow depends upon the following factors:

1. **The Duration of the Hypotension:** Short periods of hypotension are tolerated better than prolonged periods. Is there a deterioration of effective compensation with maintained hypotension? Brunschwig[4] has suggested 1½ hours as the maximum duration of the hypotensive period. It remains for the clinician who employs induced hypotension to determine the safe duration of its use. Thus far a safe period of hypotension cannot be defined.

2. **The Degree of the Hypotension:** It has not been established that vasodilatation can parallel extreme reductions in arterial blood pressure maintenance of organ blood flow. When the decrease in mean arterial blood pressure goes below the critical pressure necessary for the blood flow to a specific organ, circulatory insufficiency will result no matter how complete the vascular dilatation within that organ. Hampton and Little,[5] in a survey of the complications of controlled hypotension, demonstrated a significant increase in the incidence of complications when systolic blood pressure was maintained below a level of 80 mm Hg.

3. **The condition of the Blood Vessels:** (especially those of the heart, brain, liver and kidneys). If these vessels are sclerotic and inelastic, constriction in response to hypotension cannot occur. This is the unknown quantity with individual variation which makes the ultimate effects of induced hypotension unpredictable. Therefore, before hypotension is used, some attempt must be made to evaluate the degree of circulatory elasticity present.

4. **The Metabolic Needs of the Tissues During Hypotension, Especially Those of the Heart and Brain:** Lower cellular oxygen demand will permit greater reductions in blood flow without ill effect. Metabolism is lowered by preanesthesia medication, general anesthesia and lowered body temperatures (refrigeration). Spinal anesthesia, by its reduction in peripheral resistance and cardiac output, reduces the work of the heart and hence the demand for coronary blood flow and oxygen. It is possible that the heart is not damaged during moderate hypotension if the coronary vessels are capable of dilatation.

5. **The Production and Liberation of Specific Depressant Substances Arising from Ischemic Tissues:** Shorr[6] has demonstrated the production of such a substance in the liver of shocked animals. Does such a substance play any part in the prolonged postoperative hypotension frequently seen following the clinical use of induced hypotension? Perhaps other toxic products which adversely affect body physiology also are liberated.

The effect of the reduction in mean arterial blood pressure by hexamethonium on the circulation of the heart, brain, liver and kidneys has been experimentally studied. These results are briefly presented.

1. **Effect of hexamethonium on cerebral circulation.** Recent investigation has demonstrated that with a reduction in mean arterial blood pressure of 47% there was not a significant reduction in cerebral blood flow. Cerebral metabolism was not changed. A 46% decrease in cerebral vascular resistance maintained the cerebral circulation. It is not to be implied that similarly effective compensation always accompanies greater blood pressure reductions.

2. **Effect of hexamethonium on the cardiovascular system.** In patients without congestive heart failure and whose cardiac outputs were in the normal range, the hypotensive response to hexamethonium was accompanied by a decreased cardiac output and little or no change in total peripheral resistance. Fall in blood pressure with hexamethonium was due to a decrease in cardiac output on the basis of a decreased venous return. This is verified by a uniform reduction in pressure of the right side of the heart. Fall in blood pressure with hexamethonium is not entirely due to a reduction in peripheral resistance.

3. **Effect of hexamethonium on hepatic-portal blood flow.** Despite a moderate reduction of hepatic vascular resistance, estimated hepatic portal blood flow usually falls after hexamethonium.

3. **Effect of hypotension on renal blood flow.** Renal plasma flow decreases paralleling the initial fall in arterial pressure and then rises to approximate control levels despite a continued hypotension. The kidneys appear to be more resistant to the effects of hypotension than are other critical organs.

Many complications have been reported incident to the use of controlled hypotension and probably reflect a deficiency in organ blood flow during the hypotensive period. The incidence of these complications is very difficult to establish on a cause and effect basis. Too many complex factors could influence their development. It is important to point out that the incidence of complications is significantly greater when the level of the systolic blood pressure is maintained below 80 mm Hg. From the results of a survey of 21,000 cases where induced hypotension was used, 46 deaths attributed to the method were reported or an incidence of 1 in 459 cases. The incidence of complications was vastly higher (549) or 1 in 38 cases.

CONCLUSIONS

No one can question the value of induced hypotension during surgery. Uncontrolled hemorrhage may jeopardize the life of the patient, it prolongs operating time and prevents the completion of a proposed operation. It has had many clinical trials with excellent results. The reports are encouraging. However, it is difficult to alter our concept of thinking in terms of normal blood pressures. Too long has the importance of adequate pressure head been stressed to abandon it suddenly. It must be recognized that hypotension is potentially dangerous and the indication for its use must outweigh its serious implications. The decision to use controlled hypotension should be made by the surgeon, not the anesthesiologist. It should be employed as a surgical adjunct with full knowledge that it violates the cardinal surgical teaching of hemostasis. The ultimate acceptance of this technic must await the test of time with accumulation of evidence demonstrating a lower incidence of mortality and morbidity when it is employed. Would it not be preferable to employ less drastic reduction in blood pressure producing a modified hypotensive technic which could permit relatively bloodless surgery with a greater margin of safety than to rely upon acute reductions of blood pressure which are potentially dangerous?

SUMMARY

Induced hypotension may be used prophylactically (to reduce blood loss) where excessive amounts of blood loss are anticipated during surgery or it may be used as a therapeutic tool to arrest otherwise uncontrollable hemorrhage which has occurred. Since the majority of the complications encountered are referable to derangements of function of the brain, heart, and kidney, it might appear unwise to use controlled hypotension in aged, sclerotic patients who give a history of coronary, cerebral or renal insufficiency.

While the concept of the control of operative bleeding by induced hypotension is old, its possible acceptance as a routine procedure is guarded. The question that must still be answered is "How safe is induced hypotension"?

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Recent Trends in Anesthesia

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The comparatively recent introduction of so many agents and technics in anesthesia would seem to warrant some attempt at appraisal of their relative merits.

BALANCED ANESTHESIA

The present trend of the intravenous administration of hypnotic and relaxant agents in combination with inhalation anesthesia has caused many to say that the "art of inhalation anesthesia" has been lost. It might even be inferred that anesthesiologists are becoming less skillful because the use of the newer agents and methods does not require a high degree of skill. Actually, the reverse is true: the proper administration of several agents in combination so as to obtain the best results from each agent requires considerable skill. Such a combination, correctly employed, also provides excellent surgical relaxation and is much less traumatic to the patient than other agents used singly would be. The use of several anesthetic agents to obtain the desired effect of each agent and yet avoid the undesirable effects of high concentrations of a single agent is generally termed "balanced anesthesia." The advantages of balanced anesthesia have become so evident that it has become a well-established technic.

ETHER ANESTHESIA

It is not my intention by any means to imply that older anesthetic agents and methods have no merit. Only recently, for instance, Artusio[1] directed attention to the excellent analgesic properties of ether. He used it successfully in very low concentrations for cardiac surgery. Paulson[2] also has commented on the analgesic effect of ether when it is administered in combination with pentothal sodium. The important distinction is that the oldest anesthetic agents are still of value, and that slight modifications in their administration have greatly enhanced their value.

REGIONAL ANESTHESIA

The marked improvement and safety of general anesthesia has lessened the emphasis on, and the use of, regional anesthesia. Such a trend is regrettable, because regional anesthesia still offers many advantages to the patient. It is hoped that the introduction of improved local anes-

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[2] Paulson, J. A.: Thiopental Sodium and Ether Anesthesia. J.A.M.A. **150**:983-987 (Nov. 8) 1952.

thetic agents such as xylocaine hydrochloride (lidocaine) and hexylcaine hydrochloride (cyclaine)[3] will stimulate increased use of regional anesthesia.

SPINAL ANESTHESIA

Spinal anesthesia has undergone alternating periods of favor and disfavor. It was widely used during World Wars I and II. Currently it seems to be regarded with considerable disfavor. Yet, since the advantages of spinal anesthesia are many, an attempt is being made to exploit its benefits by substituting peridural anesthesia for it. Peridural anesthesia offers many of the advantages of spinal anesthesia and fewer of the disadvantages. Perhaps, until some of the present unfavorable feeling toward spinal anesthesia is modified, the method should be restricted to those cases in which it is essential. It should not be employed as a routine procedure or because it is more convenient than other technics.

INTRAVENOUS ANESTHESIA AND RELAXANT AGENTS

During the past 20 years intravenous anesthesia has gained increasingly wide favor. In fact, the ultra-short-acting barbiturates and the relaxants have markedly changed anesthetic practices. Very likely, since the short-acting barbiturates are so pleasant and so well tolerated by the patient, they will continue to be among the principle anesthetic agents. Here again, however, it should be noted, as Adams[4] did, that intravenous anesthesia is complementing other methods rather than displacing them.

The relaxant agents seemingly have overcome the skepticism with which they were first considered. A number of synthetic agents for relaxation have been produced. Those used most extensively clinically have been dimethyl ether of d-tubocurarine, decamethonium bromide, gallamine triethiodide, benzoquinonium chloride, and succinylcholine. Of these agents, succinylcholine seems to have the most desirable features. It is quickly hydrolyzed in the body so that it is readily controllable. This agent does not cause histamine to be released, so that there are few if any undesirable side effects.

The disadvantage of succinylcholine is that it may produce prolonged respiratory paralysis for which there is no antidote. When an antidote such as neostigmine, which is so effective against the paralysis produced by d-tubocurarine, is employed for similar purposes after the use of succinylcholine, prolonged periods of paralysis have been reported[5]. In fact, particular patients seem to be especially susceptible to the paralytic action of succinylcholine. Apparently, the enzymatic hydrolysis of succinylcholine is impaired in such patients. This type of impairment should always be suspected when a patient is very ill and debilitated.

Nonetheless, prolonged respiratory paralysis can be avoided if succinylcholine is administered according to known tolerance of the patient. Foldes and co-workers[6] suggested that succinylcholine be administered in such a manner that the plasma cholinesterase of every patient is "titrated," so to speak. That is, should it be noted that a small amount of succinylcholine produces marked depression of respiration, it can be assumed that there is a reduced amount of plasma cholinesterase, and the technic of administration can be modified thereby. Particular caution must be exercised in the care of such patients. Since succinylcholine normally is so rapidly hydrolyzed in the body, it is preferable to give it by continuous drip. If the tolerance of the patient is carefully observed and the rate of the drip is adjusted accordingly, there is rarely an accumulative effect. After considerable clinical experience with succinylcholine, I am most favorably impressed with it. It is satisfactory for use in combination with inhalation and intravenous anesthetic agents.

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I have always been reluctant to use relaxant agents in combination with ether anesthesia. The dosage of the relaxant is difficult to predict, and the paralytic effect which it exerts may be markedly potentiated by ether. This does not appear to be a problem when succinylcholine and ether are used in combination.

Hypotension Anesthesia

A special technic of controlling the blood pressure of patients at low levels during operations has become an accepted procedure in anesthesia. It is usually referred to as "hypotension anesthesia." Various methods have been used, such as arteriotomy, spinal sympathetic block, extradural sympathetic block, deep anesthesia, positioning of the patient, and the administration of methonium compounds and arfonad camphorsulfonate.

Recently, the method most frequently employed has been the use of the ganglioplegic drugs. Such drugs are the bistrimethyl ammonium compounds, particularly hexamethonium, and a thiophanium derivative, arfonad. The hypotensive effect of arfonad is transitory, and is thus much more controllable than the hypotensive effect produced by other agents and methods. The interval of activity of arfonad after intravenous injection is so short that is must be given by continuous drip.

Controlled hypotension has been used in almost every type of surgical operation. However, it should be noted that in the use of this method there is an added risk to the patient because of such consequences as reduced cerebral circulation, untoward effects on other organs, and particularly the kidneys, postoperative hemorrhage and prolonged hypotension postoperatively.

For some patients hypotension anesthesia is contraindicated. It should not be used for those who have myocardial disease, arteriosclerosis low blood volume, severe anemia, congestive heart failure, hypotensive states, such as occur in Addison's disease, and severe pulmonary disease.

The indication for hypotension anesthesia has been well stated by Magill:[7] "...the method should be reserved for those cases in which a successful result depends upon its application."

Hypothermia

One of the most radical departures from the normal physiologic status during anesthesia is reduction of the body temperature of the patient.

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[7] Magill, I. W.: Editorial: Recent Developments in Anaesthesia in the British Isles With Particular Reference to Induced Hypotension. Anesthesiology. 15:103-105 (Jan.) 1954.

Reduction of the body temperature during anesthesia usually is designated "hypothermia." Although this technic is radical, it apparently has made certain operative procedures possible that formerly were considered impossible. Excellent surgical results in such cases were reported by Swan and associates.[8]

Yet, before reduction of the body temperature to low levels can be accepted for routine use in anesthesia, much research must still be done. For instance, there remains the objection of a tendency toward cardiac irregularities when this method is employed, ventricular fibrillation being the most disturbing form of these. Moreover, rather elaborate equipment is essential for the best possible control during hypothermia. There must be a suitable device for lowering the body temperature. A mechanism to provide continuous electrocardiographic and temperature readings must be available. Accessory equipment, such as a cardiac defibrillator and pacemaker, must be at hand.

The patient must be anesthetized prior to and during hypothermia. As is true in any surgical procedure, the condition of the patient must be observed and supported at all times. It is obvious that one anesthetist cannot possibly minister to all the needs of a patient for whom hypothermia is being produced and maintained.

Anesthesia for Specialized Fields

A trend that has resulted in many contributions to anesthesia is that toward anesthetic technics for specialized surgery. In such cases anesthesiologists actually are practicing specialized anesthesia, such as pediatric and cardiac anesthesia. In recent years cardiac surgery has advanced so rapidly that the need became imperative for some anesthetists to devote all their efforts to the anesthetic problems involved. These men are contributing much to the success of the surgical treatment of the cardiac patient. Again, the diagnostic acumen of the pediatrician and the ever-increasing surgical treatment of infants and children have combined to bring about a greater volume of pediatric anesthesia, and in fact, much effort is being made to improve pediatric anesthesia. Leigh and Belton[9] have contributed considerably to the improvement of technics and equipment for pediatric anesthesia.

Special attention has been given to the psychic trauma caused by anesthesia and surgery among infants and children. This psychic trauma has been known to psychiatrists for many years[10], but only recently have corrective practices been developed and applied. Infants and children now receive preoperative medication for sedation, just as adults do. Basal anesthesia produced rectally has lessened psychic trauma in pediatric anesthesia. An extensive clinical trial of pentothal sodium administered rectally has been successful, but it has a disadvantage in that the recovery period is prolonged. Although it has been shown[11] that anoxia does not occur during the recovery period after the use of this technic, a longer period of postoperative observation is necessary.

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Chemical Factors in Therapeutic Agents

More and more new therapeutic agents are being introduced into medicine, and some are complex chemical compounds which exert an effect on the anesthetized patient. Some of these compounds, such as chlorpromazine, affect the patient favorably, whereas others, such as cortisone, produce unfavorable effects. Chlorpromazine centrally depresses the sympathetic nervous system[12], and apparently reduces surgical shock and postoperative complications. A period of cortisone therapy carried out prior to operation may produce adrenal insufficiency and result in serious disturbances during anesthesia[13].

Need for Individualization

Just as important as the understanding and the application of present technics in anesthesia is careful evaluation of the status of each patient. One should call upon one's knowledge of every specialty when the condition of a patient is being evaluated for anesthesia. As an illustration of this point, I have in mind a recent patient.

A Case in Point

This patient previously had undergone surgical removal of a malignant carcinoid of the small intestine. She had remained well for several years after the operation, until she noted certain symptons and signs. A small mass developed in the lower part of the abdomen. When pressure was exerted on this mass, she became flushed and so weak that it was necessary for her to assume a prone position. Examination demonstrated a fall in blood pressure on such occasions. On the basis of the history and examination the internists diagnosed the condition as the "carcinoid syndrome" originally described by Thorson and associates[14]. Such tumors liberate a substance, 5-hydroxy-tryptamine, usually referred to as "serotonin."

It was apparent that if gentle manipulation could produce the rather severe symptoms described above, then the much more traumatic actions of surgery and anesthesia might well prove disastrous Hence, in the choice of an anesthetic agent it seemed important to avoid histamine-releasing agents which might potentiate the effect of serotonin. Deep anesthesia and methods likely to result in hypotension also seemed contraindicated. Nitrous oxide and oxygen with ether were administered by means of a semiclosed system, through an endotracheal tube.

Although the carcinoid was quickly removed, with minimal loss of blood, sudden and severe hypotension developed. It occurred soon after the surgical maneuver required for excision of the lesion. The patient received 30 mg. of phenylephrine hydrochloride by continuous drip infusion before the blood pressure became stabilized, 7 hours later. Since serotonin has a histamine-like reaction, 50 mg. of diphenhydramine hyrochloride was administered, producing transitory improvement. Although the loss of blood was estimated at 150 cc., and the preoperative value for hemoglobin had been 12.5 gm. per 100 cc. of blood, 500 cc. of whole blood was given. This was done in view of the poor response to other measures, which suggested that the blood volume might be reduced. Very little improvement was noted after the transfusion. The patient was fully awake soon after the operation, but became very drowsy and responded poorly during the episodes of hypotension. The patient was carefully observed for 7 hours after the operation, which was the period required for the blood pressure to become stabilized.

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It is obvious that we did not have specific therapy for the hypotension that developed after the release of serotonin in this case. However, by careful evaluation of the information available, it was possible to anticipate untoward results and to cope with them to the best of our ability.

Summary and Conclusion

A brief exposition of some of the newer anesthetic and relaxant agents has been given, with some attention to technics either in use or in the course of development. Although recent advances in anesthesia have increased the agents and technics available, they have not simplified present-day anesthesia. Experience, skill, and knowledge remain of paramount importance.

Management of Pulmonary Ventilation under Anesthesia

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Today there is an evidenced increasing interest in the incidence of cardiac arrests due to an interruption of the normal physiology of respiration on the operating table, and in the immediate postoperative period.

How can the anesthetist provide a fast induction of anesthesia, adequate relaxation for the surgeon and still maintain good pulmonary ventilation? All too often it is impossible for an anesthetist to administer what might be termed a "good anesthetic" from a surgical point of view, without either knowingly or unknowingly compromising the respiratory physiology of the patient. The ability of many anesthetists is often judged by the rapidity with which he is able to induce anesthesia, have the patient intubated and ready for the surgeon to make the incision. There is only one way to accomplish this speed and that is by the use of excessive amounts of anesthetic drugs which produce sudden depression of the vital centers in the medulla to a point that normal physiological reflexes are abolished. The most vital function that may be lost, or severely depressed, is that of respiration. Gone are the days when the anesthetist could be guided by observation of the patient's progress through the stages of anesthesia. In those days cessation of respiration was the danger signal of Stage IV. Now we think nothing of inducing this state of affairs in the first five minutes of an anesthetic. Every drug that we use to induce anesthesia is a respiratory depressant in some degree —many to a severe degree.

Just what is the harm in depressing the respiration? The greatest bugaboo that the anesthetist has to face is the retention of carbon dioxide with associated hypoxia. Since carbon dioxide retention is always the result of respiratory depression it is the anesthetist's responsibility to make certain that hypoxia is not present. This combination of oxygen lack and carbon dioxide retention is the cause of more cardiac arrests than any other factor associated with anesthesia.

Prevention of Oxygen Lack

What means can be used to assure adequate oxygenation, or ventilation? First, the patient can be maintained in a light plane of anesthesia so that there is no impairment of intercostal function; if this is not feasible, assisted or reinforced respirations may be employed to supplement the patient's voluntary but depressed respiratory efforts.

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Presented at the 22nd Annual Meeting of the American Association of Nurse Anesthetists, Atlantic City, New Jersey, September 22, 1955.

In the event that this latter method should still be inadequate to maintain the vital signs within normal limits, or, should the surgical procedure contraindicate excessive movement of the diaphragm and mediastinum, respirations must then be controlled. This involves the abolition of the Hering-Breuer reflex and can be carried out by either manual compression of the breathing bag or by the use of a mechanical ventilator. There are two schools of thought regarding controlled respirations: 1. That which contends that it is impossible, even for a skilled anesthetist, to adequately ventilate a patient's lungs by manual compression of the breathing bag, relying solely on the elastic recoil of the lungs for the elimination of carbon dioxide. Proponents of this contention maintain that sufficient ventilation can only be provided by use of a mechanical device which delivers gases to the patient under positive pressure and removes carbon dioxide by negative pressure. 2. That which holds to the belief that mechanical means are not necessary and that an experienced anesthetist can effectively perform the same function by manual means. At the Cincinnati General Hospital, we have used both methods and have clinical evidence to substantiate the value of each technic.

FACTORS AFFECTING RESPIRATION

Let us briefly review the basic physiology with which we are concerned. Respiration, which supplies oxygen to the tissues by way of the lungs, and removes an end-product of metabolism, carbon dioxide, through the same route, is controlled by a center in the medulla. The center controls respiration through nerves to the muscles of respiration, e.g., the phrenic nerve to the diaphragm, and those to the intercostal muscles. Many factors influence the center but those with which we are most concerned are the following: (1) oxygen tension of arterial blood, (2) carbon dioxide tension of arterial blood, (3) blood pressure changes, and (4) pH or hydrogen ion concentration of the blood. Anything, such as anesthetic drugs, which depresses the activity of the respiratory center will cause alterations in the normal arterial oxygen and carbon dioxide concentrations. This, in turn, produces changes in blood pressure and pH of the blood. If the oxygen supply to the lungs falls below normal requirements from any cause, and this is allowed to persist over a period of time, a condition of hypoxia will result. Likewise, if normal tidal volume is decreased from any cause over a period of time, carbon dioxide will be retained and respiratory acidosis will ensue from a lowering of the pH of the blood. In the conscious patient a rise in blood carbon dioxide tension will stimulate the respiratory center and produce hyperventilation. By this mechanism the excess carbon dioxide can be eliminated. In the anesthetized patient respiration is no longer under the control of normal mechanisms so that respiratory acidosis is an ever present danger. In lighter planes of anesthesia, hyperpnea and elevation of blood pressure, without tachycardia, will reflect hypercapnia. However, without repeated blood samples it is difficult to assess the degree of acidosis. In the deeper planes of anesthesia the usual responses to increased blood carbon dioxide tension are absent. The stimulation to respiration may be lacking despite a high carbon dioxide tension, and an elevation of blood pressure may not be present. Patients who have remained in an acidotic state during anesthesia will frequently have postoperative hypotension, rapid, thready pulse, facial pallor, but a warm, dry skin unlike the cold, clammy skin characteristic of surgical shock. They may also recover slowly from anesthesia since carbon dioxide in excess acts as a narcotizing agent. This condition cannot be explained on the basis of blood loss or on other operative factors.

Tests for Respiratory Acidosis

The only accurate means of determining whether or not an anesthetized patient is in respiratory acidosis is by repeatedly drawing arterial blood samples during the course of an operative procedure and by getting a laboratory analysis for carbon dioxide tension. This, of course, is impractical and cannot be done as a routine. In our Clinic, however, studies have been done both in the animal laboratory and in the operating room to try to ascertain just how much respiratory acidosis is present during anesthesia. In the laboratory, both dogs and monkeys were used as subjects, and in the operating room, patients were used. Blood samples were drawn for CO_2 analysis at frequent intervals during operative procedures. Ether-oxygen or cyclopropane-oxygen were the anesthetic agents administered. Closed absorption and semi-closed technics were employed, using both reinforced and controlled respiration. In the group in which controlled respiration was the technic of choice, the majority of cases was controlled using the Jefferson Ventilator. This ventilator has a positive-negative pressure mechanism. The findings of this experiment, to date, have revealed a frightening result.

Results of Study

Of seven patients undergoing intrathoracic procedures, six were in moderate to severe acidosis throughout the operation; the seventh was in slight alkalosis. None of these patients had elevation of blood pressure or pulse rate to indicate accumulation of CO_2 and none showed cyanosis.

These findings indicate that respiratory acidosis, in more or less degree, is more frequently the rule than the exception. The question of how much harm this does to the patient is a debatable one. I am sure we will all agree that it is not a desirable situation and should be overcome if possible. However, the real danger lies when this acidosis becomes associated with hypoxia—when we have allowed the patient's arterial oxygenation to fall short of normal demands. It is then that carbon dioxide excess becomes toxic to the cardiac mechanism and sets the stage for ventricular fibrillation or cardiac standstill. This catastrophe is fortunately relatively infrequent.

Causes of Poor Ventilation

But it is a documented fact that most of the fatalities occur either during induction of anesthesia or at the close of an operative procedure. During induction the anesthetist is hurriedly trying to get the patient into a state of flaccid relaxation to meet the demands of the surgeon. Too often time is not allowed for a safe induction with security in the knowledge enough oxygen is being provided and that the patient is breathing it in a natural way. There is nothing more satisfying to an anesthetist than to have a patient with good, full respirations from start to finish of anesthesia. One of the most frequent criticisms aimed by the surgeon at the anesthetist of today is that they use "shot-gun anesthesia" and too frequently inject drugs into intravenous tubing. What the surgeon often does not realize is that a safe induction is impossible without time. Again anesthetists are many times required to carry patients to profound depths of anesthesia in order to produce sufficient relaxation, and in the lower depths of anesthesia normal physiology is not possible. Much attention is focused on the legal responsibility of the anesthetist and surgeon, but very little is written or said about their moral responsibility. There should be an understanding and a compromise between the surgeon and the anesthetist so that the patient can be protected from the hazards of "shot-gun anesthesia". Anesthetists have actually made the statement to me that they have no qualms about administering any drugs to a patient as long as the surgeon "O.K's" it and takes the responsibility. If a surgeon requests, for example, that you give a patient an intravenous anesthetic, usually because it is quicker, and the anesthetist knows that it may be contraindicated for the patient, I feel that the anesthetist is morally wrong if he goes ahead just to please the surgeon.

Please do not get the idea that I am advocating that every patient be anesthetized with gas-oxygen-ether or that syringes of Pentothal, Surital and Curare, be put away because that is certainly not my intention. But I am advocating that when a patient needs an induction with gas-oxygen-ether he should have it no matter how long it takes. Also, that when we use the faster, more depressing agents we should be able to counteract the associated respiratory depression by our skill in maintaining adequate ventilation, thereby minimizing acidosis and preventing hypoxia or anoxia.

I should like to quote, in part, from a paper by M.D. Nosworthy,[1] aptly entitled "A Return to Simplicity": "whereas a patient may be able to limit what he takes into his lungs, he has no control whatever over what may be light-heartedly injected directly into his blood stream. . . .There are various pitfalls—often of his own making—lying in wait for the inexperienced or unthinking anesthetist —Pulmonary inflation of a paralyzed patient is such a common practice during maintenance today that apnoea now holds few terrors, and consequently is produced at once by thiopentone without seemingly a thought to the cardiovascular slump which is the common sequel to injecting too much of this drug too quickly. Although this circulatory depression is fortunately only transitory, as a rule, it may progress and be longlasting. . . . .In years gone by. . . .most anesthetists were—and some still are —often content with a marked reduction in respiratory exchange: in fact, part of the toxicity ascribed to general anesthetic agents may well be due to the respiratory acidosis thus occasioned and the apnoeic technic was developed as an honest attempt to insure an efficient minute-volume exchange. . . . . Because of the belief that muscle relaxants are harmless, and because the apnoeic technic is so simple to those who understand it, active respiration is often abolished when the degree of peripheral suppression demanded by the operative procedure does not itself entail inadequate spontaneous breathing. The modern craze for speed is an added incentive to knock out the respiratory center with thiopentone, to paralyze the patient completely for the routine intubation, and then to hyperventilate with nitrous oxide-oxygen so that the patient can be ready forthwith for the knife......"

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[1] Nosworthy, M.D.: A Return to Simplicity, Anaesthesia. 8:247-254 (Oct.) 1953.

PREVENTION OF ACIDOSIS

Today there is more and more emphasis being placed on the use of lighter planes of anesthesia, adequate pulmonary ventilation and prevention of respiratory acidosis. Toward this end we, in our Clinic, are getting away from the use of the closed system, with necessarily low liter flow of gases. We have adopted the technic of using high liter flows, as much as 5 to 10 liters of oxygen in combination with nitrous oxide or helium, on a semi-closed technic, to carry the anesthetic agent of choice to the patient. In this way we feel that adequate oxygen is available to the patient and carbon dioxide is being continually "washed out". We emphasize the use of the bag pressure manometer to regulate the resistance to the expiratory phase of respiration, maintaining as little resistance as feasible to keep the breathing bag in a state of partial distention. It is our contention that over-distention of the breathing bag, with consequent resistance to exhalation, is one of the most frequent causes of carbon dioxide retention. If muscle relaxants must be used, depressed respirations are assisted by increasing the amount of bag pressure so that it can be manually compressed. It is true that in using this technic it is necessary to use more of the anesthetic agent but the results are gratifying enough to warrant it. Respirations are, almost without exception, spontaneous and adequate; the patient's skin remains pink, warm and dry; vital signs are maintained within normal limits; and at the end of the procedure the patient is responsive to the extent that he can reply to questioning. Another means which we employ to cut down on the amount of anesthetic agent needed and on reflex irritability is the frequent intravenous injection of small amounts (10-25 mgm.) of Demerol. With the judicious use of this drug we do not encounter depression of respiration or fall in blood pressure. By the above method the patient's sympathetic tone can be maintained throughout an operative procedure with concomitant maintenance of blood pressure, pulse and respiration, without the excessive central depression inherent in deeper phases of anesthesia.

SUMMARY AND CONCLUSIONS

It is hard to make definitive conclusions or propound a formula for the maintenance of good pulmonary ventilation; however, I would like to summarize with the following recommendations. 1. If we are to be able to practice anesthesia, conscientiously keeping the welfare of the patient first in order of importance, it is mandatory that we have the surgeon's complete confidence in our judgment. This can only be obtained by demonstration of our knowledge and our ability to make correct decisions and exercise good judgment over a period of time. No anesthetist who makes a practice of changing jobs once a year can ever hope to attain this respect. 2. We must keep informed about new drugs and technics and current literature on anesthesia. We must be good enough in our field so that we are prepared to cope with any anesthetic problem with which we may be confronted without having to "call for help" because we feel inadequate. No surgeon can be expected to respect our abilities if we do not have confidence in ourselves.

3. To return to the original subject, I know that the apnoeic technic is necessary in the management of some patients and that it gives very satisfactory results in the hands of those skilled in its use; however, it is my firm belief that the good anesthetist is the safe anesthetist, and that the "safest" signs of good anesthesia are the maintenance of blood pressure, pulse and respiration within the limits of normal physiology by adequate pulmonary ventilation with oxygen and elimination of the toxic effects of carbon dioxide retention.

Anectine - Succinylcholine

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For almost a century some general anesthetic agents were expected to produce not only insensibility, but muscular relaxation necessary to facilitate all surgery procedures.

Since the introduction of Curare in 1942 this role has been taken over by the drugs which cause neuromuscular blockage. A relaxed field for surgery can now be provided without poisonous saturation of all tissue cells of the body.

The ideal drug for this purpose is one which will give adequate relaxation for a period of time as is desired, unaccompanied by side effects.

Succinylcholine seems to come close to this requirement. This drug was synthesized by Hunt and Taneau in 1906, but it was not until 1949 that its powerful neuromuscular blocking activity was first demonstrated by Bonet in Italy.

The first reports of this drug as an adjunct to anesthesia appeared in 1951 from Sweden, Austria, and Britain. It was first introduced in this country in 1952.

CHEMISTRY AND PHARMACOLOGY

1. Contains 2 molecules of acetylcholine linked together at the alpha methyl group.
2. Soluble in H_2O and saline, forming a stable, slightly acid solution which shows little change even after standing in room temperature as long as 21 days; however, in alkaline solution it rapidly undergoes hydrolysis, and as much as 20% of its activity may be lost in a period of 5 minutes.
3. Neuromuscular block may be divided into 2 main types: A. Competitive, B. Depolarization.
   - A. Competitive is typified by curare, and in it the blocking agent competes with acetylcholine for the receptor site, lessening the ability of acetylcholine to initiate depolarization.
   - B. Depolarization is produced by drugs such as decamethonium which closely resembles acetylcholine and which imitates its action at the motor end plate.

Succinylcholine falls into the latter category. It causes a transient, preliminary, acetylcholine-like stimulation of the muscles followed by complete neuromuscular block due to persistent depolarization of the motor end plate.

Succinylcholine is rapidly hydrolyzed in the body by the pseudocholinesterase of the plasma into succinic acid and choline which are both natural metabolites. This probably accounts for its low toxicity and lack of cumulative action.

Anticholinesterases such as prostigmin are not antidotes but will actually prolong the action of succinylcholine.

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Presented at the Annual Meeting of the Western States Section of Nurse Anesthetists in San Francisco, April 28, 1955.

Since succinylcholine resembles acetylcholine in its chemical structure and in its depolarizing action on the motor end plate, its similarity is only true when doses many times the paralyzing doses are used.

No interference with metabolism or liver function has as yet been demonstrated, and it has not been possible to produce chronic toxicity.

Clinical Application

Succinycholine has been used for relaxation in conjunction with almost all general anesthetic agents. At the present time we at the Veterans Administration Hospital in Oakland, California, have used it with sodium pentothal only.

It is a short acting drug. Prolonged relaxation may be obtained by a continuous intravenous infusion which is regulated as to the degree of relaxation necessary.

Dosage For Long Procedures

1. One tenth percent solution may be made by adding 500 mgms. (10 cc. ampule containing 50 mg. per cc.) to 500 cc. of 5% dextrose in H_2O or saline solution.
2. Two tenths percent solution may be used by adding 2 ampules (1,000 mgms.) to 500 cc. of 5% dextrose in H_2O or saline solution.

The latter may be especially useful in those cases where it is necessary to avoid over-burdening the circulation with a large volume of fluids, such as cardiac cases.

The degree of relaxation is regulated to the surgeon's needs by adjusting the drip. It is recommended to use two separate veins for the anectine and pentothal, as anectine loses its relaxing effect when mixed with an alkaline solution.

Premedication and Technic

One hour before surgery demerol 50-100 mgms., depending on the condition and age of the patient, with scopolamine grains 1/150 or atropine 1/200-1/100 are given.

The patients at the Veterans Administration Hospital are mostly male adults, with female adults in the minority. When the patient arrives in surgery, the two veins are injected, one vein with 5% dextrose in H_2O, and another vein with 1/6 molar sodium lactate which will precede the blood to be given and also will take care of the sodium pentothal with a 2-way stopcock. When it is time to start the anesthetic, 10-15 cc. of sodium pentothal 2.5% are given, after which time the anectine solution is attached to the dextrose intravenous tubing. The drip is allowed to run as rapidly as possible for approximately 1 minute, at which time the patient is usually sufficiently relaxed to facilitate intubation. After this procedure is completed, the anectine drip is reduced to a minimum and thereafter increased to the degree of relaxation necessary. Sodium pentothal is given as it is deemed necessary, and 50-50 N_2O and O_2 given to make a balanced anesthesia.

When the peritoneum is closed, the anectine is discontinued. On completion of the surgery the patient is usually returned to the Recovery Room in a semi-conscious or conscious state.

Contraindications

The duration of the effect of anectine may depend on the plasma cholinesterase activity. Patients with severe liver damage, severe anemia, and severe malnutrition, and those suffering from polyphosphate insecticide poisoning may have a decreased plasma cholinesterase activity which may intensify and prolong the action of anectine. In such cases, in addition to the usual measures of controlled respirations and administration of O_2, it may be desirable to administer fresh blood for the purpose of restoring cholinesterase activity.

Neostigmine and other anticholinesterases as well as tensilon do not antagonize the action of anectine but, on the contrary, prolong the effect. They are, therefore contraindicated.

CASES

The following series of cases was given a combination of pentothal-N_2O-O_2-anectine with very favorable results. The average time of surgery ranged from 2 to 8 hours. The average amount of pentothal used was ¾ to 1-½ grams, varying with the patient and the type and duration of the operative procedure. The average amount of anectine used was 600 mgms. - 2,000 mgms., also varying with the operative procedure.

Lymph node dissection (abdominal)	1
Sigmoid resection	1
Craniotomy	1
Lobotomy, prefrontal	1
Orthopedic cases	23
Spinal fusion	1
Appendectomy	5
Splenectomy	1
Radical mastectomy	2
Thoracotomy	2
Exploration of antrum	1
Ligation and excision, hemangioma in foot	1
Esophagoscopy	13
Cordotomy	2
Radical neck dissection	4
Colon resection	1
Hernioplasty	16
Hemorrhoidectomy	14
Colostomy	3
Adult tonsillectomy	1
Cholecystectomy	5
Pelvic laparotomy	1
Thyroidectomy	1
Radical excision tracheostomy	1
Pelvic exenteration	1
Lobectomy, cerebral	1
Skin grafts	6
Gastric resection	21
Maxillary gland resection	2
Sympathectomy	4
Full mouth extractions	1
Cardioplasty	1
Fractured mandible repair	1
Plastic repair, cancer of lip	1
Hydrocelectomy	2
Abdomino-perineal resection	10
Laminectomy	12
Axillary node dissection	1
Hiatal hernia repair	1
Aortogram	7
Pyelolithotomy	2
Colectomy	1
Dilatation and curettage	5
Cystoscopy	3
Transurethral resection	3
Bowel resection	3

RESULTS

EFFECT ON RESPIRATION

Respiratory depth decreased as the respiratory muscles became paralyzed. Partial paralysis of the diaphragm has been encountered, at which time assistance of respiration was necessary.

EFFECT ON CIRCULATION

Very little change in the pulse rate has been encountered. A moderate rise in blood pressure has occurred which was controlled by assistance to respiration. In two cases in the above list it was necessary to remain with the patient for approximately one hour after surgery for the respirations to become constant.

MUSCLE RELAXATION

Abdominal relaxation was considered good to excellent.

SUMMARY

Succinylcholine is an effective, non-toxic, muscle relaxant with minimal side effects and does not affect the cardiovascular system. There is very brief duration of action which is usually profound with minimal dosage with an exceptional prolongation of effect.

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Notes and Case Reports

INTERPRETATION OF NFPA PAMPHLET NO. 56

Part III, titled Administration, is the last of the main divisions of the National Fire Protection Association's standard No. 56 "Recommended Safe Practice for Hospital Operating Rooms". This part is devoted to rules and regulations for personnel. The first section, number 7, deals with the general recognition of hazards and responsibilities. Hazards can only be mitigated when they are understood, so that recognition of hazards is most important. It is the responsibility of all of us to adopt and enforce regulations for safety. Hospital administration is particularly charged with this responsibility. Hospital administration includes not only the administrator and the board of trustees, but also every department head, every one with administrative duties. Which means the heads of anesthesia departments are jointly responsible for a program of education for all who work in anesthetizing locations, also a method of enforcement of safety rules. "It is the expressed purpose of the requirements of these standards and recommendations to provide protection against explosion hazards without unduly limiting the activities of the surgeon. This principle, without minimizing anesthesia explosion hazards, recognizes the hazards to life that are inherent in surgical procedures."

Section 8 on Hazards, includes a provision for the disposal of waste ether. This is a problem which is not solved here, nor has anyone as yet come up with a foolproof answer. Depending on the sewage system and the presence or absence of open traps, ether and other waste flammable liquids may or may not be poured down drains. Also ether cans have been known to explode when thrown away because sufficient flammable vapor or a small amount of ether is left in the can. The heavy vapor of a large quantity of ether poured on a window sill to evaporate could come in contact at some lower level with a hot plate, burning cigarette or some source of heat and cause a fire. It is not recommended that waste ether be used by operating room personnel nor by anyone for the cleaning of needles and such.

Administrative functions concerning Hazardous Areas are included in section 9. The Temperature-Humidity Control in section 10 deals with ventilation of storage locations and anesthetizing locations.

Section 11, Handling of Gases, refers to the Standard for Nonflammable Medical Gas Systems which is N.F.-P.A. standard No. 565. This section charges administration with providing regulations which will assure safe handling of combustible anesthetic agents by hospital personnel. Identification, Storage of Containers, Location of Cylinders, Special Precautions for the handling of Oxygen Cylinders, Regulators and Valves, Cylinder Connections, and Transfilling are all subheadings in this section. "Transfer of gas from one cylinder to another on the hospital site or by hospital personnel should be prohibited."

The administrative aspect of the Electrical Hazards in section 12 is very important, dealing with the necessity of written reports of inspection, replacement of defective equipment, good maintenance, and the establishment of regulations for safe practice. So-called "pigtail" connections should not be used in hazardous locations. Doctors bringing in their own special electrical equipment should provide them with the proper kind of connector. The "pigtail" connections should be reserved for use in non-hazardous locations. Rules and regulations should be written for each hospital and enforced. If a hospital spends thousands of dollars to incorporate the mechanical devices necessary for the life safety of patients and personnel, surely it is necessary for administration to provide the needed safeguards against the so-called human element of failure. This means an educational program to familiarize all those working in anesthetizing locations with the nature of the hazards, how the various mechanical safety devices work, the benefits of built-in safety such as conductive flooring, casters, mattresses, etc., what the rules and regulations are, and how best to enforce them.

Section 13 deals with Electrostatic Hazards, those which are so baffling, and those which are so intimately connected with anesthetists as they are working. Consideration of personnel clothing and conductivity tests are in this section. It is the intent of the rules concerning clothing that there will be no chance for pieces of clothing which are good generators of electrostatic charges to swish against each other in walking or moving about on a stool and building up an electrical charge which can not be dissipated or drain off via conductive shoes to the conductive floor before the possibility of sparking. Testing the conductivity of personnel should be under the same circumstances as found during working conditions and this will determine whether clothing worn is safe, remembering that the prohibited materials should be avoided.

The last section, 14, concerns the writing of rules and regulations and a suggested form is printed.

Harriet L. Aberg
A.A.N.A. Representative to
National Fire Protection
Association's Committee on
Hospital Operating Rooms

The TWENTY-THIRD QUALIFYING EXAMINATION for membership in the A.A.N.A. will be held May 12, 1956. Deadline for transcripts and applications is April 2.

Annual Meeting
A. A. N. A.
September 17 - 20, 1956
Chicago

Legislation

Emanuel Hayt, LLB., Counsel, A.A.N.A.

IOWA NURSE ANESTHETISTS

In view of the decision in the Iowa Hospital Association case, this opinion by the Attorney General of the State of Iowa is being published to give reassurance that the decision does not affect nurse anesthetists. The Attorney General in that State has held that it is not illegal for a registered nurse to give anesthesia under the direction of a licensed physician and surgeon.

REPORT OF THE ATTORNEY GENERAL

REGISTERED NURSES: ADMINISTRATION OF ANESTHETICS.

The administration of anesthesia by a licensed nurse, under the supervision and direction of a licensed physician, constitutes the practice of nursing and not practice of medicine.

June 27, 1946. *Mr. Herman B. Carlson, Director Division of Law Enforcement, State Department of Health, Building:* Receipt of your inquiry of June 19, 1946, is acknowledged, wherein you request our opinion on the following question:

"Is it illegal under the Iowa law for a registered nurse to give anesthesia under the direction of licensed physician and surgeon?"

In answering your inquiry we observe that there is no specific provision in our statutes requiring that a license of any type be held by a person administering anesthesia, and such practice would be illegal only if the same constitutes the practice of one of the several healing arts for which a license is required by the Practice Acts, which are contained in Title VIII, Chapters 146 to 158, inclusive, 1946 Code of Iowa.

Assuming that your inquiry is limited to the question whether the indicated act would constitute the practice of medicine, for which a license is required, we note that Section 148.1 of our Code defines who shall be deemed to be engaged in the practice of medicine, and that Section 148.2 provides:

"Section 148.1 shall not be construed to include the following classes of persons:

4. Licensed podiatrists, osteopaths, osteopaths and surgeons, chiropractors, *nurses,* dentists, optometrists, and pharmacists *who are exclusively engaged in the practice of their respective professions.*"

The portion of the statute set out specifically exempts licensed nurses who are exclusively engaged in the practice of nursing from the provisions of our law relating to the practice of medicine, and since your inquiry indicates that the anesthetic is administered by a licensed nurse, we must necessarily first give attention to the question of what acts constitute the practice of nursing.

Our statute defining "nursing," Section 152.1, provides that any person shall be deemed to be engaged in the practice of nursing "who practices nursing as a graduate or registered nurse or publicly professes to be a graduate or registered nurse and *to assume the duties incident to such profession,*" and we must look elsewhere to determine what the duties incident to such profession are.

Scheffel and McGarvah in their treatise entitled *"Jurisprudence for Nurses"* define "nursing" as:

"Any and all acts performed for gain, hire or reward, either direct or indirect, by any person which acts have been their objective the making of any sick, injured, infirm or helpless person either physically or mentally more comfortable, or which keep them in a hygienic condition as a result of their efforts and administrations, *or carrying out orders or directions of licensed practitioners of the healing art, or in any way professionally assisting for gain or hire such practitioners. * * *.*"

> Webster's International Dictionary defines the term "nursing" as: "To attend and take care of a sick or feeble person."

In *Chalmers-Francis v. Nelson,* 57 Pac. (2d) 1312, Supreme Court of California, 1936, the question considered was whether the administration of general anesthetics by a registered nurse, employed by the defendant hospital, constituted the illegal practice of medicine. The court held that it was not because the evidence showed conclusively that everything done by the nurse in the administration of the anesthetic was done under the immediate direction and supervision of the operating surgeon and his assistants. In so holding the court said:

"The findings, which are amply supported by the testimony in this case, show conclusively that everything which was done by the nurse, Dagmar A. Nelson, in the present instance, and by nurses generally, in the administration of anesthetics, was and is done under the immediate direction and supervision of the operating surgeon and his assistants. Such method seems to be the uniform practice in operating rooms. There was much testimony as to the recognized practice of permitting nurses to administer anesthetics and hypodermics. One of the plaintiff's witnesses testified to what seems to be the established and uniformly accepted practice and procedure followed by surgeons and nurses and that is that it is not diagnosing nor prescribing by the nurses within the meaning of the Medical Practice Act. We are led further to accept this practice and procedure as established when we consider the evidence of the many surgeons who supported the contention of the defendant nurse, and whose qualifications to testify concerning the practice of medicine in this community and elsewhere were established beyond dispute * * *.

Aside from the proposition that nurses in the surgery during the preparation for and progress of an operation are not diagnosing or prescribing within the meaning of the Medical Practice Act, it is the legally established rule that they are but carrying out the orders of the physicians to whose authority they are subject. The surgeon has the power, and therefore the duty, to direct the nurse and her actions during the operation."

In *Frank v. South,* 194 S.W. 375, Kentucky Court of Appeals, 1917, it was likewise held that a nurse administering anesthetics under the personal direction and supervision of a physician was not engaged in the practice of medicine. In so holding the court significantly said:

"It seems that it would be impossible to practice medicine in any sense in which the term could be used without the practitioner making a diagnosis of the symptoms of the patient, and to determine what disease the patient is afflicted with, and then to determine and prescribe what remedy should be used, in attempting to treat the ailment or infirmity with which the patient is suffering. *The mere giving of medicines which are prescribed by a physician in charge who has made a diagnosis and determined the disease, and determined the remedy and directs the manner and time and the character of the medicines to be administered, has never been considered engaging in the practice of medicine. The person who administers medicine under such a state of case does not exercise any judgment as to the character of the disease nor the necessary remedy nor the manner in which nor when the medicine should be administered, but merely acts as the hands of the physician in administering the medicines in the quantities and at the times directed by the physician.* It having been agreed that (the nurse) has never prescribed for any person, nor treated any human ailment or infirmity—unless the administration of anesthetics to a patient undergoing or preparing to undergo a surgical operation, and in the presence and in accordance with the directions of the surgeon in charge, who prescribed the anesthetic to be administered, it would seem that she is not engaged in the practice of medicine within the meaning of that term in accordance with its popular sense."

In a West Virginia case, *Cook v. Coleman,* 11 S.E. 750, it was held in an action for malpractice based on the adminstration of an anesthetic by a nurse, that it was error to permit an expert witness to testify that in his opinion the administration of ether by a Doctor of Medicine is legally required, because neither the common law nor any of the statutes of that state required such method of administration.

While these cases merely hold that administration of anesthetics by a licensed nurse is not the unlicensed practice of medicine where done under the direction and supervision of a licensed practitioner of medicine, under the particular statutes of the State where the decisions were rendered, they are important in that they seem to incidentally also recognize the principle that the practice of nursing and the practice of medicine occupy overlapping fields of activity, and that while many acts ordinarily performed by a nurse constitute the practice of medicine in the abstract sense, these same acts become the proper functions of a nurse when performed under the supervision and direction of the physician. This is based on the theory that the danger of diagnosis and determination of a proper remedy and prescription therefor are removed where the nurse merely acts as the hands of the physician.

There is an indication in these cases also, that, although there is no unanimity of opinion, a considerable group of practitioners of medicine are of the opinion that the administration of anesthesia by a licensed nurse is a duty incident to the practice of medicine. Absent any direct authority on the question in this jurisdiction, it revolves itself into a strictly fact question, the answer to which can be supplied ac curately only by the testimony of qualified expert witnesses. Assuming that the testimony of such witnesses be as in the cited cases, and absent any prohibitions or limitations in our own statutes, we are inclined to the view that our courts would hold that such administration of anesthesia by a nurse under the provision and direction of a licensed physician would be held to be a duty incident to the practice of nursing within the definition of nursing contained in Section 152.1 of our Code, and as such not illegal when so administered.

The foregoing view of it would seem to render unnecessary any determination as to whether such administration of anesthesia constitutes the practice of medicine. Without so deciding, we are of the view however, that where the anesthesia is administered under the supervision and direction of a licensed physician, the same would not constitute the practice of medicine. Other jurisdictions have so held, as indicated in the authorities cited above, on the theory that there is no diagnosis of ailment or precribing of a remedy therefor, except by the licensed medical practitioner under whose supervision and direction the anesthesia is administered, and that when one so administers anesthesia he is merely acting as the hands of the physician. The principle that the elements of diagnosis of human ailment and the prescribing of a remedy therefor are matters which must be shown to evidence the practice of medicine. It is recognized by all the cases in our jurisdiction dealing with that question, and the principle is stated in the recent case of State v. Robinson, 19 N.W. 2d 214, where our courts held as follows:

"The term 'practice of medicine' is defined by Section 2538. It is not confined to the administering of drugs. Under this statute one who publicly professes to be a physician, and induces others to seek his aid as such, is practicing medicine. Nor is it requisite that he shall profess in terms to be a physician. It is enough under the statute if he publicly profess to assume the duties incident to the practice of medicine. What are 'duties incident to the practice of medicine'? Manifestly the first duty of a physician to his patient is to diagnosis his ailment. Manifestly, also, a duty follows to prescribe the proper treatment therefor. ***If, therefore, one publicly profess to be able to diagnose human ailments, and to prescribe proper treatments therefor, then he is engaged in the practice of medicine, within the definition of Section 2538.***"

To sum it up, it is our opinion that the administration of anesthesia by a licensed nurse under the supervision and direction of a licensed physician constitutes the practice of nursing, thus removing it from the field of the statutes regulating the practice of medicine by virtue of Section 148.2, does not constitute the practice of medicine without a license, and is therefore not illegal. It should of course be recognized that this opinion is intended only as an aid to your department in formulating its policy toward the commencement of civil proceedings or criminal prosecutions where complaints are presented to your department involving the question presented in your inquiry.

Until our Legislature passes specifically upon the proposition one way or another, we recommend that no such actions be instituted. Such a policy would not foreclose persons who deem themselves adversely affected thereby from enforcing their rights, for it should be observed that such persons still have the opportunity to assert those rights by legal proceedings brought in their own name.

Use Of Unsterile Needle By Hospital Nurse Gives Patient Damages And Bars Collection Of Bill—Plaintiff brought an action for damages for malpractice. The complaint alleged that defendant's nurse negligently made use of an unsterile needle and syringe in giving plaintiff an injection in her hip. The evidence revealed that plaintiff entered defendant's hospital for observation and diagnosis and that at that time she was given an injection to relax her. The area where the injection was administered was not scrubbed with alcohol, and the place began to hurt and sting at once. By early morning the following day, the area was badly swollen and red. Plaintiff was permitted to leave the hospital but had to return two days later. She was running a high fever and it was apparent to her physician that an abcess had formed at the place where the injection was administered. Plaintiff was compelled to remain in the hospital for about two weeks and submit to an operation for the removal of the abcess. At trial plaintiff's evidence established the connection between the formation of the abcess and the injection. It was a reasonable medical certainty that the abcess developed because of an injection with an infected needle. Plaintiff had judgment and defendant appealed contending that the evidence was insufficient to support the finding, and that it should have been allowed judgment on its counterclaim for the costs of plaintiff's second hospitalization. This court held that the finding of negligence was supported by the evidence. The use of an infected needle was obviously a departure from standard hospital procedure. The court further held that defendant's claim for costs was properly rejected where it was found that defendant's negligence was the proximate cause of plaintiff's hospitalization. The judgment for plaintiff was affirmed.

(Kalmus v. Cedars of Lebanon Hospital, 281 P. 2d 872-Calif.)

Unauthorized Operation Gives Cause Of Action Without Proof Of Negligence—Plaintiff brought an action for damages against defendant, a physician. Plaintiff's evidence showed that she visited defendant on June 26, 1951, and was treated by him for thyroid trouble; she was also given a vaginal examination. In August, 1951, defendant again examined plaintiff and told her she might be pregnant or that she might have a tumor. On September 11, 1951, the defendant examined plaintiff at which time she again had a vaginal examination and allegedly underwent an operation to which she did not consent. Plaintiff was allegedly told by defendant that he was removing blood clots so that she could menstruate properly. After performing his work plaintiff was told to go to the hospital because defendant thought that she was going to have a miscarriage. On September 18, 1951, plaintiff was very ill and she consulted another physician. Upon examination that doctor found that plaintiff's cervix was badly lacerated, and that this laceration had been caused by an external force of terrible amount. Plaintiff was anesthetized and a currettement was performed and a fetus was removed. Thereafter plaintiff had to undergo a hysterectomy. At trial defendant had the verdict and judgment. On appeal plaintiff con-

tended that the jury was improperly instructed. This court held that the instructions as given by the lower court were contradictory. The jury was in effect precluded from considering plaintiff's cause of action for an operation performed without her consent, since the jury was told that no verdict could be rendered against defendant unless it found that defendant was guilty of negligence. The judgment for defendant was reversed.
(Lewis v. Hendricks, 284 P. 2d 518-Calif.)

Private Hospital Not Entitled To Statutory Limit For Loss Of Patient's Jewelry—Plaintiff was admitted to defendant's hospital in an unconscious condition. At that time she was wearing a pair of diamond earrings which were securely attached to her ears by perforations in the ear lobes. While plaintiff was still unconscious these earrings were removed from plaintiff's person to facilitate the taking of X-rays of her head. The earrings were wrapped in a piece of Kleenex and attached to plaintiff's bed gown. When plaintiff regained consciousness, the earrings were gone. Plaintiff brought action alleging that defendant was indebted to her to the extent of $975. The lower court held that defendant's liability was that of an innkeeper and limited by statute to $250. Plaintiff appealed. This court held that the statute which limited an innkeeper's liability was extended to cover "... the operator of a voluntary hospital, rest home or sanitarium..." The term "voluntary" in the statute was held to designate charitable institutions and not private hospitals. Defendant was not entitled to the benefit of the limitation granted to voluntary hospitals. The judgment was increased to $975, and as modified affirmed.
(Reid v. Herrick Foundation, 280 P. 2d 241-Calif.)

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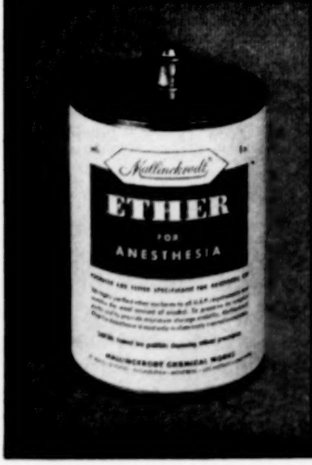

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FOR ANESTHESIA

Book Reviews

Geriatric Anesthesia. By Paul H. Lorhan, M.D., Professor of Anesthesiology, Department of Anesthesiology, University of Kansas Medical Center, Kansas City, Kansas. Pajco Lexide. 90 pages. Springfield Illinois: Charles C. Thomas, Publisher, 1955. $3.25.

Another in the American lecture series, a monograph in the American Lectures on Anesthesiology, this book is written by the professor of anesthesiology at the University of Kansas Medical Center. The text covers briefly the general considerations in the administration of anesthesia to the aged, some of the physiologic changes that occur, the pre-operation surgical management, and pre-anesthetic medication, with considerable detail as to the drugs. Each anesthetic agent is considered separately as are the muscle relaxants. Anesthetic management and postanesthetic management are thoroughly discussed. Thirty-nine references complete the text. This 90-page book will be of great interest to those who must deal with the aged patient.

Complications of Regional Anesthesia. By Daniel C. Moore, M.D., Director, Department of Anesthesiology, Mason Clinic; Chief of Anesthesia, Virginia Mason Hospital, Seattle, Washington. Cloth. 291 pages, 51 figures. Springfield, Ill.; Charles C Thomas, Publisher, 1955. $10.50.

Devoting entire chapters to complications, not only of the methods but of the agents used in nerve blocking, the author has brought together a wealth of important information for those who practice the technics or care for patients who have had regional blocks. Each chapter treats of a specific complication and is followed by an extensive list of references. In addition to the main body of the text an appendix lists the complications for the specific regional blocks and cross refers to the text for elucidation. In addition to this appendix the book is well indexed. The author cautions that " although this book is entirely devoted to the complications or regional block procedures, this should not be construed to mean that complications following regional nerve blocking occur frequently or that this type of anesthesia is more dangerous than other types."

Introduction to Operating-Room Technique. By Edna Cornelia Berry, R.N., A.B., Head Nurse, Operating Rooms. University Hospitals of Cleveland, Cleveland, Ohio, and Mary Louise Kohn, A.B., R.N., M.N., Formerly Instructor in Operating-Room Technic, Frances Payne Bolton School of Nursing, Western Reserve University, Cleveland, Ohio. Paper. 154 pages. The Blakiston Division, McGraw-Hill Book Company, Inc., New York, Toronto and London, 1955. $4.00.

Prepared primarily for students, this book follows the outline of teaching of operating room technics beginning with an orientation of the student to surgery, and including the construction, organization and economy of operating rooms, sterili-

(Continued on page 56)

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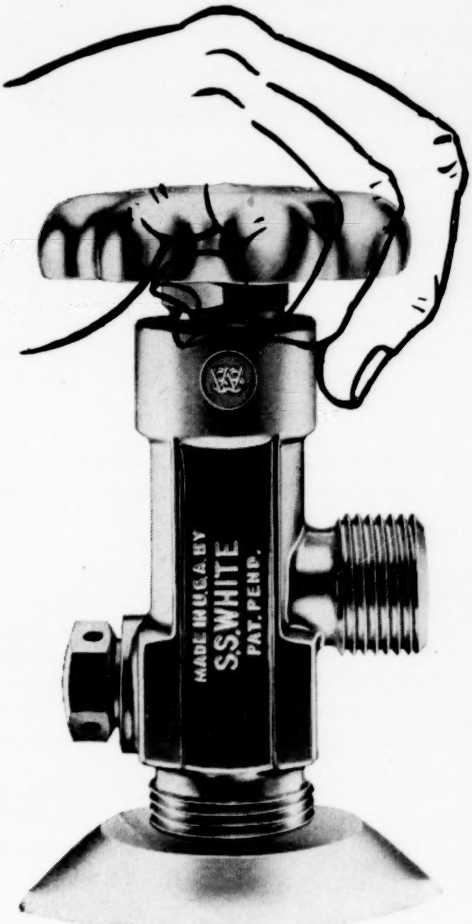

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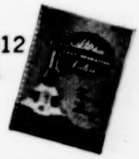

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Abstracts

Watts, D. T.: Epinephrine in the circulating blood during ether anesthesia. J. Pharmacol. & Exper. Therap. 114:203-210 (June) 1955.

"Much indirect evidence indicates that stimulation of the sympathico-adrenal system by ether anesthesia releases significant quantities of epinephrine. . . . However, there is other evidence which indicates that sympathico-adrenal function is not stimulated during ether anesthesia. . . . The present experiments have been conducted in an effort to determine whether or not there are increased quantities of epinephrine in the circulating blood during ether anesthesia. . . . Plasma epinephrine levels have been followed in rabbits and in dogs during the various stages of ether anesthesia. The rat uterus intermittently stimulated with carbachol with an automatic apparatus was used for all assays. There were significant increases in plasma epinephrine in the rabbit at the end of induction of surgical anesthesia and after thirty minutes surgical anesthesia. In dogs the plasma epinephrine levels during quiet ether anesthesia were variable, ranging from undetectable levels in most experiments to very high levels during hypertensive episodes in a few animals. During ether overdosage significant quantities of epinephrine were observed in most dogs at the time of respiratory arrest and increased to very high levels at the time of cardiovascular failure with hypotension."

Virtue, R. W., and Simmons, B. F.: Effect of respiratory acidosis and alkalosis on cyclopropane-epinephrine induced arrhythmias in the dog. J. Pharmacol. & Exper. Therap. 114:148-150 (June) 1955.

"In 1950, Johnstone reported that adequate ventilation of patients would offset cardiac arrhythmias that developed during cyclopropane anesthesia. This finding has been repeatedly confirmed clinically. Experiments were undertaken to find whether change of carbon dioxide concentration inhaled by dogs would affect the incidence or severity of cyclopropane-epinephrine induced arrhythmias. . . . It seems possible, then, that carbon dioxide may stimulate an output of endogenous epinephrine, which under the sensitizing influence of cyclopropane anesthesia could cause ventricular arrhythmias in man. Such a stimulus would be insufficient to produce irregularities in the dog heart. When carbon dioxide is present in high concentrations it exerts a protecting action against concentrations of epinephrine that are required to cause arrhythmias in the dog. It seems probable that carbon dioxide would also have a protective action in man if the person had survived the effect of the original release of endogenous epinephrine. If, after prolonged administration, carbon dioxide should be rapidly washed out, its protective action might diminish so that a sensitized heart could fibrillate, even in the dog. . . .

"The incidence of cyclopropane-

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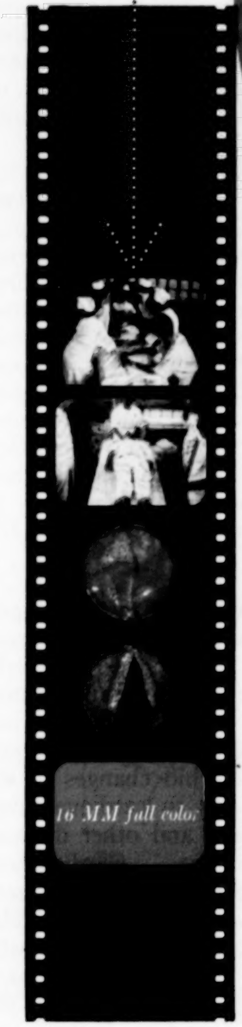

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epinephrine induced arrhythmias in 20 dogs has been ascertained during respiratory alkalosis, and again during respiratory acidosis. Similar observations were made using 10 more dogs that were first in respiratory acidosis, and later when they were in alkalosis. Three of the 30 dogs went into ventricular fibrillation during alkalosis, and one fibrillated during acidosis. Ventricular arrhythmias were more numerous and significantly more prolonged during alkalosis."

Corssen, Gunter: The anesthetic management of the aged. (A report of 5450 cases). Texas Rept. Biol. & Med. **13**:386-405, 1955.

"In all previous publications related to geriatric anesthesia relatively little specific information was given regarding preoperative morbidity and physical state of aged patients facing anesthetics for surgical procedures. Intra- or postoperative complications possibly connected with or favored by the anesthetic agent or method had not been adequately investigated. Little knowledge seemed to exist also concerning the influence of the length of operation and anesthetic on the occurrence of complications during the procedure or in the postanesthetic period. Therefore, we felt it worthwhile to study these problems more thoroughly and to attempt to demonstrate the particular circumstances under which we conduct anesthetics for the aged. This may be beneficial to anticipate and perhaps avoid severe and fatal complications. In this 12 year study (1942-1953), we review anesthesia records of patients aged 60 years and older undergoing surgery and receiving a general or spinal anesthetic. The total number of all anesthetic procedures during this period was 46,253. Five thousand four hundred fifty anesthetics were given to 5,075 patients 60 years of age and older. This was 11.8 percent of the total number of patients. . . .

"The total number of patients was 5,075. Of this number there were 3,622 males (71.4 percent and 1453 females, 28.6 percent). The greatest number of operations on male patients is explained by the role which the urology service plays in aged males. . . . Three thousand four hundred eighty-eight patients. . .suffered from a moderate, severe or extreme systemic disorder. Three hundred forty-seven patients. . . underwent emergency procedures. Thirty-six of these patients. . .came practically moribund to the operating room. . . The average operating time was 88 minutes. Four hundred twenty-two anesthetics, 7.7 percent of the total, lasted more than 3 hours. The longest operation lasted 9 hours. . . . One hundred five complications occurred in connection with operations lasting less than one hour, which is 4.8 percent of the total number of operations (2,173 operations); 619 complications occurred in connection with operations lasting more than one hour, which is 18.8 percent of the total number of operations (3,277 operations). . . .

"The percentage of healthy aged patients, meaning patients free from any systemic disorder, is relatively small. The specific problems of anesthesia for the aged are therefore not so much associated with age itself but with the morbid changes in the old organism due to cardiovascular, pulmonary, renal and other diseases favored by old age. . . . Cardiovascular disturbances are the most frequent preoperative complications. The relatively high number of patients who belong to the group with pulmonary complications indicates that the physiological atrophic degenerative

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changes of the lung tissue in the aged are often combined with additional morbid processes of inflammatory or non-inflammatory origin. A severe anemia (hemoglobin below 10 grams) was present in 292 patients. The incidence of cases with a moderate anemia was much more frequent. . . .

"The choice of the anesthesia method and the selection of the anesthetic agent for elderly patients is a special problem. It should be based on the principle of guaranteeing the utmost safety for the patient. Secondly, the needs and requirements of the surgeon should be recognized. Finally, the anesthetist should be absolutely familiar with all technics and methods he may use. Anesthesia for aged patients is no place for methods which are not well-established in the anesthetist's repertoire. In general, we cannot say that we found a special anesthetic drug or particular technic of significant advantage over another. However, we administered cyclopropane in almost all major surgical procedures and especially to the poor risk patients of this series. . . .

"More than 90 percent of all the spinal anesthetics given were to patients belonging to the genito-urinary service. . . . The relatively small number of severe complications following this technic justifies the conclusion that low spinal anesthesia for prostatectomies and other genito-urinary procedures is well tolerated by aged patients. . . .

"The use of short or longer acting relaxants such as curare or curare-like drugs should be restricted to properly selected patients. As a rule, the musculature of the aged patient is naturally flaccid as compared to that of younger adults. Therefore, there is usually no need of additional relaxation in administering, for example, a satisfactory cyclopropane-ether anesthesia. Tightness of the abdominal musculature is often the sign of hypoxia following an impaired respiratory exchange. In giving curare or curare-like drugs to cover the negative results of an apparently inadequate technic, one should easily cause a fast deterioration in the patient's condition by increasing the respiratory difficulties and subsequently augmenting hypoxia. The slower breakdown and the delayed elimination of curare in old patients should be another factor to which our attention is attracted if this drug is chosen for use. Failure of the cardiovascular system was the main factor in the occurrence of intraoperative complications. . . .

When circulatory distress did develop it was sudden in origin and difficult to correct. Patients of advanced age should be followed closely throughout their stay in the operating room with particular attention being paid to the immediate replacement of even the smallest amounts of blood lost during a surgical manipulation. Elderly patients tolerate any degree of hypoxia very poorly and for this reason anesthetic mixtures should always have a high oxygen content. Provided the fundamental requirements of blood replacement and oxygen supply are considered, the hypofunction of the autonomic nervous system in the aged should not be necessarily detrimental. . . .

"Ninety-three patients went into circulatory distress or shock either in the operating room immediately after finishing the surgical procedure or on the ward during the very early postoperative period. We therefore consider this period the most dangerous part of the entire anesthetic procedure. The already reduced auto-

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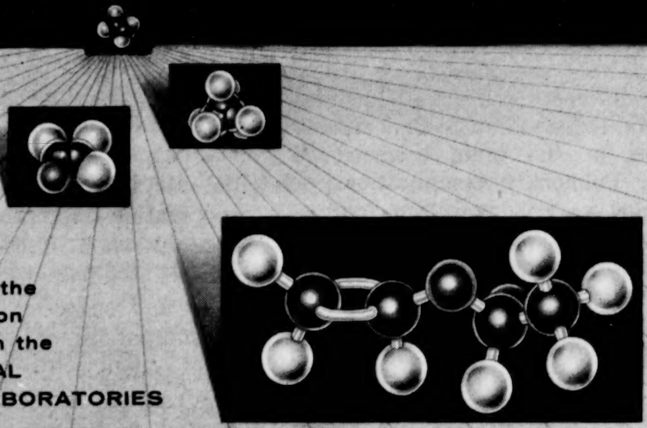

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nomic adaptability together with an additional loss of automatic tone induced by the still effective anesthetic agent may be mainly responsible for those pronounced circulatory disturbances after surgery. . . . In our series, thrombosis or embolism which affected either the lung, the coronary arteries or the brain occurred 74 times. Pulmonary complications do not play a very significant role. . . . Two hundred seventy-nine deaths occurred in our series. . . . The mortality rate increased with advancing age. . . . The importance of a recovery room to reduce early postoperative complications was noted."

Burgison, R. M., O'Malley, W E., Heisse, Claire K., Forrest, Jane W. and Krantz, J. C., Jr.: Anesthesia XLVI. Fluorinated ethylenes and cardiac arrhythmias induced by epinephrine. J. Pharmacol. & Exper. Therap. 114:470-472 (Aug.) 1955.

"In former studies the authors showed that ethylene appeared to be unique among the gaseous and liquid hydrocarbons in that upon inhalation it did not sensitize the myocardium to epinephrine. This same property was shown to prevail with the deuterocarbon analogue of ethylene. Recently our studies with fluorinated hydrocarbons and ethers led us to the observation that perfluoro ethyl ether was devoid of anesthetic properties. Indeed it appears that in ethers and hydrocarbons the anesthetic potency bears an inverse ratio to the degree of fluorination. It occurred to us that it would be of interest to investigate the effect of fluorination in the aliphatic hydrocarbons upon cardiac automaticity . . . . Tetrafluoroethylene and difluoroethylene, like ethylene, are incapable of sensitizing the myocardium upon the injection of a challenging dose of epinephrine. The chlorination of difluoroethylene produces a mixed halogenated ethylene which causes cardiac sensitization."

BOOK REVIEWS

(Continued from page 48)

zation, asepsis, positions and instruments. In addition to the other phases of surgical technic an excellent section on anesthesia is included. In the chapter on anesthesia there are definite suggestions to the nurse for cooperating with the anesthetist for the protection of the patient. Each chapter is followed by a list of questions and suggested assignments. A substantial list of references and an index concludes the volume. The text is presented on 8½ x 11 pages perforated to be put into a standard ring binder in order that additional information may be interspersed.

Hypothermic Anesthesia. By Robert W. Virtue, M.D., Ph.D., Associate Professor and Head of Division of Anesthesiology, University of Colorado School of Medicine, Denver, Colorado. American Lecture Series Publication Number 275. Cloth. 62 pages. Springfield, Ill.: Charles C Thomas, Publisher, 1955. $2.50.

A great share of this book is devoted to an historical account and a review of the literature on the subject of hypothermia in relation to anesthesia. Written in a style that makes for interesting reading, the author has brought the information up to date. In one chapter he outlines the clinical procedure now used at the University of Colorado for anesthetizing human patients and inducing hypothermia. A brief chapter calls attention to the deficient knowledge on this subject. The deficiencies indicate the trend for future experiments. Because so many problems are unsolved, the author treats the present publication as an interim report. 84 references are included.

Insurance

AANA Professional and Personal Liability Program

The formal announcement that a Financial Security Program was adopted by the Board of Trustees on September 17th brought about a flood of requests. The inquiries were for more information about the Accident and Health Plan and the Retirement Plan. However, the requests for information about the Liability Plan outnumbered all other requests.

The adoption of the Program by the Board of Trustees only authorized the insurance broker to proceed with the preparation of the policies and many forms necessary to install the broad and comprehensive plan. The various insurance companies were notified of the approval and then the real work began. It is because of this preparatory work that the Liability Plan was delayed. However, policies are now being issued and all members of the AANA may apply and receive prompt attention.

The AANA Liability Plan is unique inasmuch as it is designed exclusively for the Nurse Anesthetists and combines Professional and Personal Liability coverage. It is a 24-hour protection, both on and off duty. This comprehensive policy will give an insured member the peace of mind that goes with a well-balanced insurance plan.

We may feel that because our employer has some kind of insurance, we are protected. That is a very debatable question. As professional people, we are held liable for our acts. Therefore, we may be 'joined in' in a lawsuit or separate suits may be filed against our employer and the Anesthetists. These are problematic, and not being attorneys, we cannot offer legal advice.

If we have a question in our minds in regard to the purchase of Liability Insurance due to a large premium involved, perhaps a pro and con discussion could be in order. In view of the extremely low premium, even for the maximum amount of $15,000.00 per person and $45,000.00 protection in any policy year, it is better to be sure of this financial security than take the chance of self-insurance. The premium is only $13.95 a year. This plan includes the important protection of Personal Liability also. Every person with a sense of responsibility should have this protection. This insurance protects us against suits, real or alleged, for damage to other people or property. An accident such as a cleaning woman or maid injuring herself on our property could result in a damage suit. If we own a dog and the dog bites someone, we are responsible. A fall on our stairs or injury in our apartment or on our grounds could result in a suit.

This type of protection is an excellent protection. In view of the fact that it is included along with the Professional Liability at the same

(Continued on page 63)

THE AMERICAN ASSOCIATION OF NURSE ANESTHETISTS

Professional and Personal approved and sponsored Liability Program (This program was officially approved and adopted by the Board of Trustees, Sept. 17, 1955)

Combining both professional and personal liability insurance for the member Nurse Anesthetists.

Plan I—$5,000/15,000 Professional liability protection plus $10,000.00 personal liability—Premium for one year $9.00.

Plan II—$10,000/30,000 Professional liability protection plus $10,000.00 personal liability—Premium for one year $11.00.

Plan III—$15,000/45,000 Professional liability protection plus $10,000 personal liability protection—Premium for one year $13.95.

Protection up to $5,000, 10,000, or 15,000 depending on the plan you select for any one person injured or up to $15,000, 30,000 or 45,000 in any one policy year.

PLUS

$10,000 personal liability each occurrence, against claims arising out of injury to another as a result of personal activities of a non-professional nature.

Protection both on and off duty.

Please enroll me in:

AANA

Professional & Personal Liability Insurance

Name____

Address____

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Enclosed is remittance for $____________ **for Plan #**__________.

I do______**do not**______**have any claims against me at present arising out of professional or personal negligence.**

Signature. . . . .

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NURSE ANESTHETISTS—FLORIDA! Take advantage of Florida's sunshine and pleasant living. Jacksonville's rapid growth has created a need for hospital expansion. St. Vincent's has just completed an addition of 150 beds and has completely remodeled the existing hospital, which is located on the beautiful St. Johns River. Need 4 qualified anesthetists at once to complete a staff of 9. Beginning salary $450.00 per month with merit rating increases. Call rotation every 4 nights with time off following calls. 2 weeks annual vacation with graded increase to 4 weeks after 5 years service. 2 weeks sick leave. New nurses home under construction. No obstetrical call for surgical anesthetists, but obstetrical anesthetists are needed also, so applications are in order for either position. Only emergency operations on Saturday or Sunday. Apply: St. Vincent's Hospital, Jacksonville, Florida.

WANTED: Nurse Supervisor-Anesthetist for small general and industrial hospital; southwest; mining community; attractive salary; excellent working conditions; supervisory experience necessary. Living quarters available. Write: Box M-18, Journal of American Association of Nurse Anesthetists, 116 South Michigan Avenue, Chicago 3, Illinois.

ANESTHETIST wanted for replacement by February 1, 1956 in 340 bed general hospital. Present department has two anesthesiologists and five nurse anesthetists. All types of anesthesia used. For information write to Richard E. Allen, M.D., The Memorial Hospital, Wilmington, Delaware.

NURSE ANESTHETIST: For 300 bed hospital near Pittsburgh. Average forty hours per week. Starting salary excellent with guaranteed yearly increases. Write details of training and experience to Administrator, Butler County Memorial Hospital, Butler, Pa.

WANTED NURSE ANESTHETIST: Experienced. Modern hospital in central Connecticut on main parkway. Surgery and Anesthesia Suite only four years old, completely new. Good housing, excellent meals. Pay—one of top salaries in state. Apply Administrator's Office, The Meriden Hospital, Meriden, Connecticut. Telephone: Meriden, Beverly 5-7971.

NURSE ANESTHETIST: 100 bed general hospital, Southeastern Massachusetts, to work with Anesthesiologist. Salary, etc., open depending on training and experience. Contact: William H. Lewis, M.D., 376 Tremont Street, Taunton, Mass.

NURSE ANESTHETIST: To increase staff in new hospital. Pleasant working conditions and excellent salary. Apply: Catherine M. Little, Weirton General Hospital, Weirton, West Virginia.

POSITION WANTED: Man nurse anesthetist with more than ten years experience desires position in obstetrical or surgical fields of anesthesia or both where on Friday evenings and on Saturdays the work be limited to obstetrical and emergency surgical anesthesia. Call and work duty assignments including Sundays acceptable at any other time. Write: Box No. M 14, Journal American Association of Nurse Anesthetists, 116 South Michigan Avenue, Chicago 3, Illinois.

NURSE ANESTHETIST WANTED: Petersburg General Hospital is a modern, 240 bed hospital with four operating rooms. All types of surgical cases are done with the exception of neuro-surgery and thoracic surgery. Starting salary $500.00 per month. Working basis: five days a week with alternate call every third night and every third weekend. Apply to: H. C. Hoover, M.D., Petersburg General Hospital, Petersburg, Virginia.

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1. Hingson, R.A., Davis, H.S., Inman, C.E., and LeLievre, R.E.: Am. Pract. 6:1004 (July) 1955

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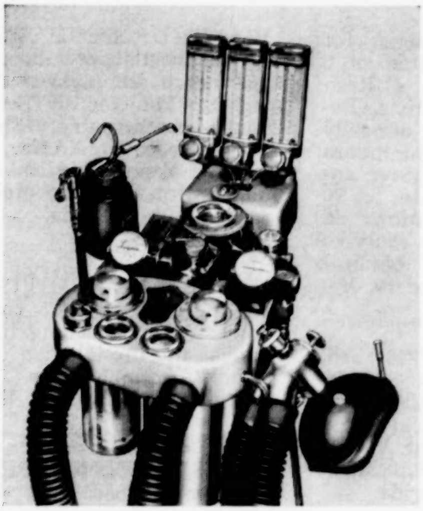

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WANTED: Nurse Anesthetist for 800 bed teaching hospital. Staff of 6 Anesthesiologists, 1 Fellow, 4 Residents, and 9 Nurse Anesthetists. Beginning cash salary, $4,512.00 annually with merit rating increases, one month paid vacation, 15 days sick leave annually, which can accumulate to 90 days; only emergency operations on Saturday and Sunday. Please reply to the Anesthesia Department, Medical College of Virginia, Richmond 19, Va.

ANESTHETIST, R.N.A., 250 bed, accredited General Hospital, 8 hour duty, 6 day week, city of 250,000, near beaches. Salary $400.00. Medical Anesthetist in charge of department. Write: Director of Anesthesia, Tampa Municipal Hospital, Tampa, Florida.

NURSE ANESTHETIST: This 27 bed air-conditioned hospital located 34 miles south of Memphis on Highway with an average of 20 operations per month and another anesthetist on the staff could use a nurse anesthetist at a salary of $450.00 per month plus room, board, and laundry (equivalent to an additional $82.50 per month), social security, pension plan and Blue Cross. Two weeks vacation and sick leave with pay. Applicants capable of acting as supervisor of nursing service preferred. Write: Tunica County Hospital, Tunica, Mississippi.

WANTED: Nurse anesthetists for new University Medical Center. Address inquiry including acceptable terms to Department of Surgery, School of Medicine, University of Missouri, Columbia, Missouri.

NURSE ANESTHETISTS WANTED: Immediate openings at modern 327 bed general hospital with active up-to-date anesthesia department. Registration not a requirement if sufficiently experienced. Pleasant working conditions. Attractive salary in addition to complete maintenance. Generous vacation, sick leave and holiday allowances. Unusually good opportunity for those seeking permanent positions in a well established department. Apply: Director, Eastern Maine General Hospital, Bangor, Maine.

WANTED: Nurse Anesthetist. 335 bed county general hospital. Call rotated each 4th night with the following day off. $400.00 per month plus meals and laundry. Liberal vacation and sick leave. AANA member preferred. Apply: Medical Director-Administrator, Duval Medical Center, Jacksonville, Florida.

NURSE ANESTHETIST: For modern air conditioned 5 room operating suite in busy teaching hospital. Work under anesthesiologist. Contact: Assistant Administrator, Mount Sinai Hospital, Minneapolis, Minnesota.

REGISTERED NURSE ANESTHETIST: 135 bed general hospital in charming southern city of 18,000 short drive from Gulf of Mexico. Well qualified surgical staff. Salary range $380 - $416 per month commensurate with experience. 4-weeks vacation with pay, sick leave, 2½ day weekend every 4th week. Apply: Administrator, John D. Archbold Memorial Hospital, Thomasville, Georgia.

NURSE ANESTHETIST: Immediate vacancy, obstetrical anesthesia only. 511 bed expanding general hospital with active obstetrical service. No call. 40 hour week. Attractive salary, personnel policies, benefits program. Friendly working relationships. City of 120,000 Northeastern Ohio close to metropolitan advantages of Cleveland and Pittsburgh. Write: Director of Personnel, Aultman Hospital, Canton, Ohio.

ANESTHETISTS: Charleroi-Monessen Hospital (general, 238 beds and 36 bassinets), North Charleroi, Pa. (HU 3-5561). Salary open plus maintenance, sick leave, holidays, month paid vacation annually, etc. Call or write administrator.

REGISTERED NURSE ANESTHETISTS: 40 hr. week, permanent positions open for surgery and obstetric departments. Liberal vacation and sick leave policies. Social security, overtime pay, extra pay for night duty. No call duty. Automatic pay increases. Apply: Chief Nurse Anesthetist, Harper Hospital, Detroit 1, Michigan.

NURSE ANESTHETIST: For approved general hospital. Must be able to administer latest types anesthetic agents. Salary $350.00 to $375.00 per month plus full maintenance. Annual vacation and sick leave. Retirement benefits if desired. Apply: Administrator, Robinson Memorial Hospital Ravenna, Ohio.

NURSE ANESTHETIST: Excellent salary and working conditions. Shore resort community. Send resume of experience and background to Personnel Office, Lawrence and Memorial Associated Hospitals, New London, Conn.

WANTED: NURSE ANESTHETIST. Group of 5 physicians and one nurse. Salary open. Contact: Albuquerque, Anesthesia Service, Medical Arts Square, N.E., Albuquerque, New Mexico.

INSURANCE

(Continued from page 57)

premium, we should protect our financial interests.

The $250.00 Medical Allowance for an injury to another person is also included in this Plan, which makes this the best insurance buy of the year.

This Plan is for the exclusive benefit of our members. We strongly urge every member to fill in the application on Page 158 and forward this application to National Headquarters without delay.

John C. Maginnis
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AANA

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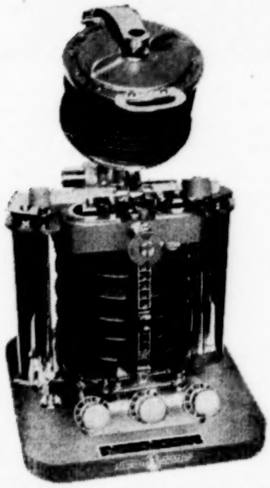

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